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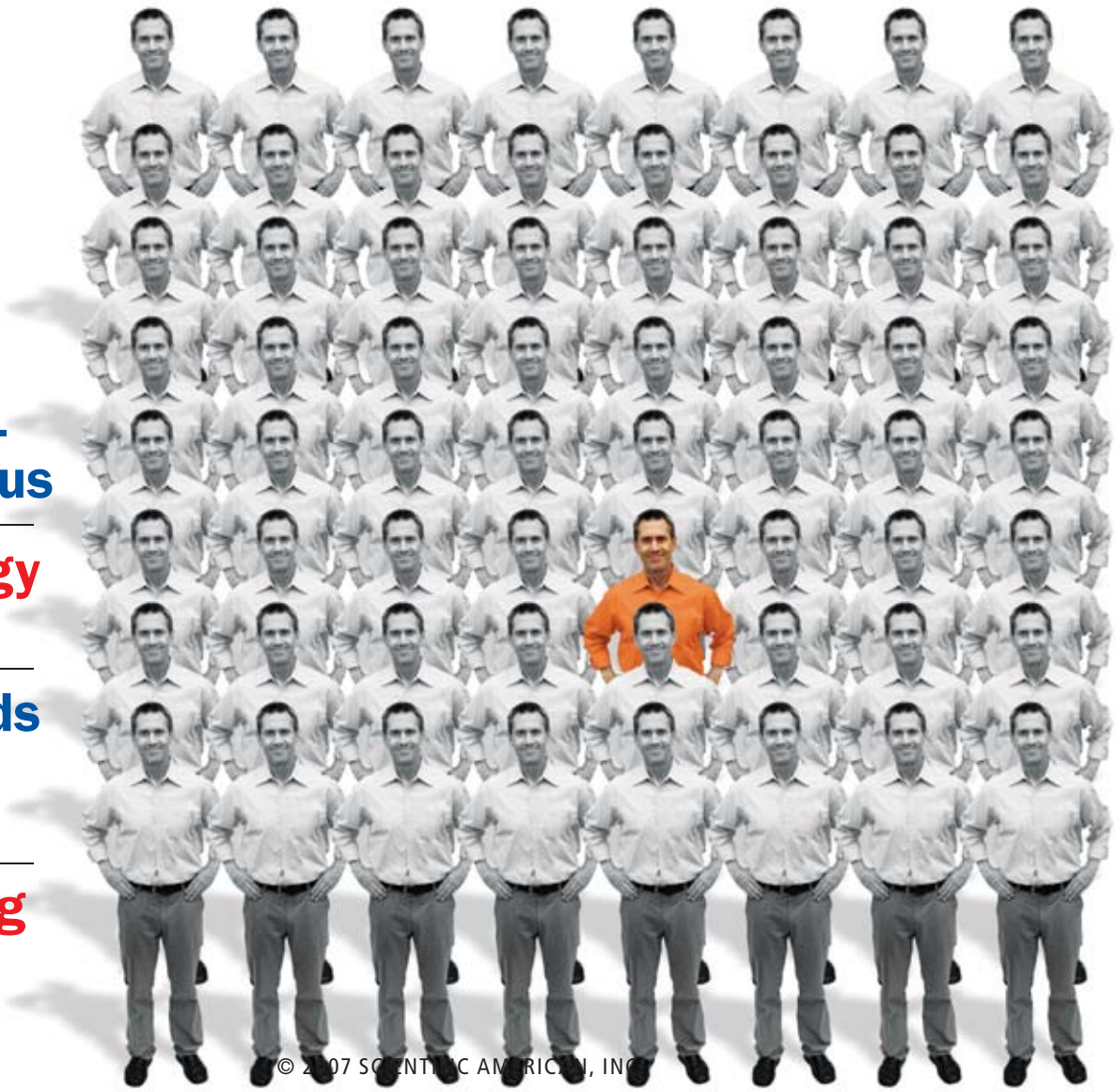
Causes of School Shootings page 52

New Insights about LEADERSHIP

Power and charisma aren't enough. The best leaders guide groups from within.



PLUS:

The Mind-Body Nexus

Psychology of eBay

How Words Shape Thought

Preventing Dropouts

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COVER IMAGE BY JOHN WILKES

Social Beings

Forget the notion of projecting winning charisma, sharp intelligence and an aura of absolute authority. Researchers who study leadership say those traits are not the ultimate keys to greatness. Good leadership isn't something you can create by yourself—after all, the followers have their own ideas and needs. And although coercion through carrot (reward) or stick (punishment) may be sufficient to achieve short-term goals, neither will change minds and hearts.

As social psychologists Stephen D. Reicher, S. Alexander Haslam and Michael J. Platow describe in their cover story, "The New Psychology of Leadership," heads of state and bosses alike must work to understand the values and opinions of their citizens or team members. The goal is a dialogue about what the group embodies and stands for—and thus how it should act. The best leaders, therefore, shape what their followers *want* to do by molding the group's identity in ways that promote their agendas. For more, follow us to page 22.

Exerting influence over another individual's decisions and thoughts about any given issue can be as simple as adjusting how you broach the topic or pose the question. Intriguing research shows that the language used profoundly biases the choices we make. In "When Words Decide," starting on page 36, psychologist Barry Schwartz explains how descriptions may steer not only what we select but also whether we enjoy or appreciate that option.

Complex social give-and-take is at work in humanity's virtual worlds as well. Tens of millions of people send checks to perfect strangers they encounter on the Internet at eBay. Why? Logically, it would be most profitable for sellers to pocket the money from would-be buyers without shipping the merchandise. They don't do so, however, because it's not fair. Buyers know that, so they trust sellers to hold up their end of the bargain. "Is Greed Good?" asks Christoph Uhlhaas in his article, which begins on page 60. Whether they have consciously considered the matter or not, people who use eBay intuitively know the answer.

Mariette DiChristina
Executive Editor
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MISLEADING MASS

In "Addicted to Food?" Oliver Grimm states that a body mass index (BMI) of a specific value makes a person obese. I disagree: BMI is a simplistic formula based on height and weight that is often inaccurate.

Every time I go in for a physical, the nurse starts to lecture me that I'm overweight based on the calculation of a BMI of 25. Then I interrupt the nurse, and she sheepishly admits that my BMI does not mean I am fat.

I'm under 15 percent body fat and expect to be under 10 percent soon. My mass comes from muscle. I engage in an intense workout at least five times a week.

It worries me that no one ever writes down my body fat percentage. Anyone looking at my medical record would think I'm at risk for obesity. What happens when people start to make medical decisions based on my BMI record?

My experience points to the danger of using BMI; what's true about me is exactly the opposite of how BMI is typically interpreted. And such interpretations are given more credence than they deserve when scientists make statements like "A BMI above 25 indicates obesity" without qualifying them.

Joe Thoennes
San Francisco

THE EDITORS REPLY: *It is true that there are more useful ways than BMI to measure health and obesity in individuals. But when used to study large groups of people, BMI provides an accurate snapshot of a population's health—the small number of outliers for whom BMI is misleading do not make a statistical difference. So Grimm's report that "about one third of American adults are overweight, and nearly another third are obese," based on a survey of BMI, is a fair portrayal of the big picture.*

SUPPORT FOR STALKERS

I believe "A Personal Obsession," by Isabel Wondrak and Jens Hoffmann, was incomplete. The authors state, "Fortunately, celebrity stalkers rarely used violence against their targets." Unfortunately, some stalkers use violence against themselves. The article speaks of the mental status of the victim but not of that of the stalker. The article also doesn't offer any hope for either party.

One horrific case was David Letterman's stalker, Margaret Mary Ray. She was gripped by the psychotic fantasy that she was romantically involved with Letterman. According to the *New York Times*, her bizarre behavior, including breaking into his home and stealing his car, was often treated as fodder for comedians. But at the root of Ray's obsession was a very serious mental illness.

Ray was diagnosed with schizophrenia. The illness frequently can be managed with drugs, but getting patients to stay on their prescriptions can be difficult. Ray was in and out of jail. When she took her medication, she would get better and be released; then she would stop taking her pills and be reincarcerated.

The last time Ray stood trial, she was released despite the judge's concerns that no existing law could guarantee psychiatric help for her. Within months, Ray was dead, having thrown herself in front of an oncoming train.

Ray and individuals like her now have the assistance of the Mental Health Court Program, a strict proba-

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tion and case management program that prevents the mentally ill from being wrongly housed in prison, while also protecting society from their criminal behavior. There is hope.

For more information, please visit www.consensusproject.org.

Rae Packard
Yucca Valley, Calif.

CLASSICAL ANGST

Although Robert Epstein is almost certainly correct when he suggests in "The Myth of the Teen Brain" that "teen turmoil is the result of the artificial extension of childhood" past puberty, he errs when he claims that teen turmoil is a "creation of modern culture, pure and simple."

It is not so simple. In ancient Roman society, paternal legal rights and inheritance patterns prolonged a dependent preadult state in a significant percentage of young males. (History records much less information about females.) All sorts of adolescent antisocial behaviors were on display in Rome, including drinking, gambling, gluttony, illicit heterosexual and homosexual activities, dabbling in the occult and armed violence. Contrary to the assertions of historian Marc Kleijwegt of the University of Wisconsin–Madison, whom Epstein cites, many Roman authors comment on the turbulent (or lazy and vicious, if they're more unkind) nature of youth. Indeed, there was a Latin phrase describing this stage: *lubrica aetas,* the "slippery age."

Blaming modernity for adolescent ills is too easy. It would appear that any society, ancient or current, that exhibits significant economic complexity and social stratification will bring out tendencies toward disorder in the young.

Mark E. Vesley
St. Paul, Minn.

DIAGNOSING AUTISM

In "Autism: An Epidemic?" [Facts and Fictions in Mental Health], Hal Arkowitz and Scott O. Lilienfeld claim that the rate of autism is not increasing; rather our sophisticated diagnostic procedures have simply detected more autism cases. I would like to offer readers another perspective, as a clinical psychologist.

Some would like to believe that there are not more cases, just more kids encompassed within the "pervasive developmental disorder" (PDD) spectrum, which includes a range of symptom severity. The logic used is that we have changed the diagnostic criteria, thus including a broader population. But *DSM-III*—the manual used by doctors to diagnose mental health disorders in the 1980s—contains the diagnosis of PDD as well as that of autism. Many of the criteria currently considered for a diagnosis of "autistic" (or a condition along the autism spectrum) are encompassed in the PDD criteria of 1980. Call it what you will: the symptoms were described back then.

In addition, a team of 13 prominent physicians compiled the section of *DSM-III* that dealt with disorders of infancy and childhood. Their conclusions: infantile autism is "very rare (2–4 cases per 10,000)," and childhood PDD is "an extremely rare disorder." So what are we to deduce? It appears that we have two options: (a) the physicians, experts in the field of child psychiatry, were poor diagnosticians who failed to recognize thousands of impaired children (if, as Lilienfeld and Arkowitz claim, the rate was one in 166 back then), or (b) the rate has risen.

Randall Strandquist
Spokane, Wash.

ARKOWITZ AND LILIENFELD REPLY: *In contrast to* DSM-III *of 1980, the later editions, namely,* DSM-III-R *and* DSM-IV, *include a new category of "PDD not otherwise specified" (PDD NOS), which encompasses many subsyndromal (mild) cases. Research suggests that PDD NOS and other milder variants now account for about three fourths of all autism diagnoses.*

The diagnosis of autism has become considerably less stringent from DSM-III *to* DSM-IV. DSM-III *required that all six criteria be met, whereas* DSM-IV *requires that only any eight of 16 criteria be met. Moreover, as University of Wisconsin–Madison psychologist Morton Ann Gernsbacher and her colleagues noted,* DSM-III *criteria for autism required "a pervasive lack of responsiveness to other people" in contrast to* DSM-IV *criteria, which require only "qualitative impairment in social interaction." Strandquist's conjectures do not explain why research on a sample of more than 10,000 British children showed no increase in autism prevalence between 1992 and 1998, when researchers ensured that the diagnostic criteria remained constant.*

Moreover, the apparent rise in autism rates derives from administrative (for example, school-reported) rather than population-based estimates, only the latter of which allow accurate measures of prevalence. Although we should remain open to the possibility of a genuine rise in autism diagnoses pending new data, the evidence for this rise remains uncertain at best.

CAROL AND MIKE WERNER *Phototake*

Are autism cases really on the rise?

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Head Lines

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>> THE BRAIN

White Matter Listens In

Brain cells thought to be bystanders communicate using chemicals

Our brain cells are chattier than previously thought, according to a new study. Cells in white matter, once believed to passively relay information between neurons, were found to eavesdrop on the messages they carried and to receive chemical signals from other cells.

Until now, researchers believed our brain had a basic division of labor between gray matter and white matter. In gray matter, neurons form dense networks and process information by sending signals along fingerlike projections called axons. White matter was thought to play a supporting role by producing a white protein called myelin that coats the axons and allows them to send signals more quickly.

But a new mouse study led by neurobiologist Dwight Bergles of Johns Hopkins University found that certain white matter cells form synapses to listen in on the signals in axons. Just as neurons in gray matter connect to and communicate with one another via axonal projections, oligodendrocyte precursor cells in white matter connect to the axons running past them to pick up the chemical signals those axons release.

"There's the same kind of signaling in white matter as in gray matter," Bergles says. This surprising finding may explain why previous studies suggest that learning new skills increases the amount of myelin in specific regions of white matter. Scientists have long known that when we learn, our brain forms new synaptic connections among gray matter neurons to maximize information transfer—much like building new lanes on an increasingly busy highway. White matter could respond similarly, ramping up myelin production and raising the speed limit along certain routes. Although it is not yet known exactly how this myelin buildup takes place, these results suggest that white matter could be picking up "go" or "stop" signals from axons, directing the myelination process and setting the optimal speed for information transfer in our brain. —*Mason Inman*

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>> PERCEPTION

The Hidden Power of Culture

The society in which we live influences the way our brain perceives the world

Culture influences the songs we sing, the steps we dance and the words we write. It also shapes our brains. Scientists have long known that neuroplasticity allows individual events to sculpt the brain's form and function. Now there is evidence that life experience as intangible as culture can also reorganize our neural pathways. Recent research has found that culture influences the way a person's brain perceives visual stimuli such as scenes and colors.

In one study, psychologists showed people 200 complex scenes, such as an elephant in a jungle or an airplane flying over a city, while scanning their brains with functional magnetic resonance imaging (fMRI). The team, led by Denise C. Park of the University of Illinois, studied young and elderly subjects from the U.S. and Singapore. For Westerners of all ages, the images triggered activity in a part of the brain associated with object recognition called the lateral occipital region, whereas the same object-associated areas were not activated in the older Asians' brains.

"An Asian would see a jungle that happened to have an elephant in it," Park explains. "Meanwhile a Westerner would see the elephant and might notice the jungle." Because the Asian subjects' responses differed between the two generations, while the older Americans matched the youths in their interpretation of the landscapes, the researchers concluded that the culture people grow up in plays a role in how they interpret what they see.

Language, says Stanford University cognitive scientist Lera Boroditsky, helps to convey and maintain a culture's conventions—and similarly affects perception. In an unrelated study, she found that Russian speakers, whose language includes two words that make a mandatory distinction between light blue and dark blue, could more quickly distinguish between shades of the color than English speakers could. In this case, language meddled in the simple task of differentiating among hues. With an infinite number of ways to perceive the world, Boroditsky says, every culture's guidebook helps to focus our brain's attention on the characteristics most important to our life. —*Corey Binns*

>> TRAUMA

Continuing Effects of 9/11

High brain activity in people affected by the tragedy could lead to later health problems

Six years after the events of September 11, researchers are beginning to understand the attacks' enduring toll on mental health. Recent studies at New York–Presbyterian Hospital/Weill Cornell Medical College and New York University have shown long-term psychological and neurological repercussions in adult witnesses who were near the World Trade Center and in children who lost a parent in the tragedy.

Researchers at Cornell and N.Y.U. compared brain scans of people who were near the WTC during the attacks and people who were farther away. Both studies found that those who were closer continue to show heightened activity in the amygdala, the part of the brain that regulates emotional intensity and creates emotional memories. In the Cornell study, functional magnetic resonance imaging (fMRI) scans showed that people within two miles of the site that day have a hyperactive amygdala as compared with people who lived 200 miles away, even though those nearby were seemingly resilient and show no signs of mental disorder. The N.Y.U. team similarly found that when asked to recall the events of 9/11, twice as many people who were near Ground Zero had elevated amygdala activity as compared with people who were five miles away in midtown Manhattan. Slow recovery of a highly active amygdala, the Cornell researchers say, could increase susceptibility to mental health problems later in life.

The N.Y.U. study also found that the direct experience of 9/11 yielded a type of memory similar to a "flashbulb memory," the exceptionally vivid, confident and multisensory recollection of a shocking public event. Those near the WTC who saw, heard and smelled the results of the attacks showed

depressed activity in the parahippocampal cortex, which encodes neutral peripheral details. This altered brain activity might help explain how flashbulb memories are formed and why they seem to last longer than other types of memories.

Another study conducted at Cornell followed 45 bereaved children who lost a parent in the disaster. Despite the fact that most received therapy during the two years following their loss, the prevalence of psychiatric illness in these children doubled from 32 percent before 9/11 to nearly 73 percent afterward. Anxiety, post-traumatic stress and separation anxiety were the most common afflictions. The grieving children also had chronic elevations of the stress hormone cortisol in their saliva, suggesting that their bodies' "fight or flight" mechanisms remained switched on. According to the researchers, long-term cortisol elevation may lead to hypersensitivity to stress later in life, which in turn could cause cognitive impairment, weak bones, and insulin resistance.

Understanding the biology underlying these vulnerabilities will help treat people who experienced this and other traumas, the researchers say. —*Karen A. Frenkel*

IMAGES.COM/CORBIS (*top*); REUTERS/CORBIS (*bottom*)

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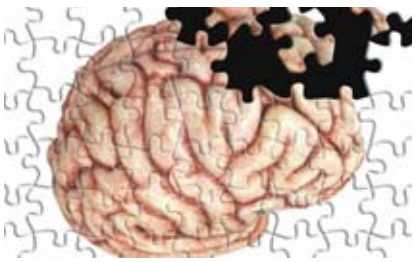
>> MEDICINE

Common Link, Common Cure?

Amyloid diseases share the same molecular substructure

What is the common thread among Alzheimer's, Parkinson's and Huntington's diseases, Creutzfeldt-Jakob syndrome and even type 2 diabetes? Patients who suffer from these diseases typically harbor a bodily buildup of oddly formed proteins called amyloid fibrils, which resemble long, twisted ribbons. Although the proteins making up the fibrils differ in each disease, a new study suggests that fibrils of all types share a feature—the tiny molecular backbones that seed the production of the fibrils and sew them together.

Chemist David Eisenberg and his colleagues at the University of California, Los Angeles, previously identified these fibril backbones in yeast afflicted with an amyloid disease. Unlike any other known protein formation, the structures resemble watertight zippers running perpendicular to the fibril itself. Now Eisenberg's team has made crystals of 30 such zippers associated with eight different human amyloid diseases and has compared their configuration using x-rays.



"Although the proteins that form these fibrils are very different, the atomic-level structures are very similar in each case," Eisenberg says.

Scientists are not yet certain whether amyloid fibrils cause the symptoms of the diseases in which they are found or are simply a by-product of some unidentified underlying mechanism, but many experts believe that preventing fibril formation could stop these diseases from progressing.

By pinpointing the specific part of each protein that causes fibril formation and showing that these parts are similar across so many diseases, these new findings could bring us much closer to cures for the 25 known human amyloid diseases. People at risk for an amyloid disease could be identified early on with a compound that binds to the zippers, Eisenberg notes. They could then be treated with another agent that prevents new zippers from forming, which, he says, "would be a very big thing." —*Melinda Wenner*

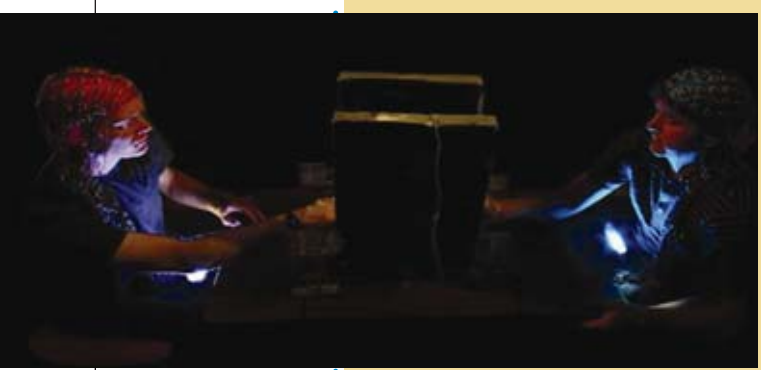
>> NEUROLOGY

Social Rhythm

Unique patterns of neural activity mark personal interactions

Whether we are home alone or at a cocktail party, electrical signals are always busy firing across our brain. When examined with electrodes, these signals appear as oscillating patterns—brain rhythms that change depending on what we are doing and thinking. Researchers have recently identified a new rhythm that appears during social interactions, offering a glimpse of the coordination that takes place within, as well as between, brains.

Neuroscientists Emmanuelle Tognoli and J. A. Scott Kelso and their colleagues at Florida Atlantic University simultaneously recorded, for the first time, the brain rhythms of two people sitting across from each other (*below*) as they each moved one of their fingers up and down. When a barrier prevented the volunteers from seeing each other's actions, there was no trace of the newly identified rhythm, dubbed phi. When the scientists removed the visual obstruction, however, phi appeared, originating from one of the regions associated with mirror neurons. Phi's complex rhythm differed depending on whether the volunteers maintained their independent finger wagging or synced up with the other person. "Phi distinguishes whether a person does their own thing or whether they coordinate with others," Kelso says.



Brain rhythms arise when groups of neurons in distant regions of the brain synchronize to generate cognitive activities such as information processing, sleep and memory. When incoming electrical messages are absorbed by tens of thousands of neurons simultaneously engaged in the same process, the resulting electrical charge is strong enough that electrodes on the scalp can detect it.

Once scientists determine a brain rhythm's function, they can make predictions about how it will behave in a variety of situations, including when the brain is diseased or damaged. Many patients with neurological disorders are able to monitor and adjust their own rhythms with biofeedback training, which can sometimes alleviate debilitating symptoms. The discovery of phi may help diagnose and treat autism and schizophrenia, diseases in which social interactions prove difficult.

—*Corey Binns*

3D4MEDICAL.COM *Getty Images (top)*; FLORIDA ATLANTIC UNIVERSITY (*bottom*)

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>> LANGUAGE

See What I Say

Read lips to familiarize yourself with voices

Being accustomed to the sound of a person's voice makes it easier to hear what she is saying. New research shows that simply being used to watching somebody's soundless lip movements has the same effect.

A research team at the University of California, Riverside, asked 60 volunteers to lip-read sentences from silent videos of a person talking. Then they listened to an audiotape of sentences spoken in a background of noise and were asked to identify as many words as they could. Half the volunteers listened to the same person they had just watched, and the other half heard a different talker. Those who lip-read and heard the same person identified words in the muffled sentences better than those who lip-read from one talker and listened to another.

The findings suggest that our brain can transfer familiarity with the way a person moves his mouth while he talks into familiarity with the sound of his voice, "even if we have never actually heard that voice," says lead researcher Lawrence Rosenblum.

Although scientists have long known that visual signals play a key role in speech recognition, how the brain blends the two stimuli is still a mystery. Some imaging studies suggest that the auditory cortex is involved in the processing not only of audio but also of visual speech information.

But our brain constructs the words we ultimately perceive from more than just sounds and lip movements; our expectations come into play as well. Many studies have shown that people hear speech differently depending on their beliefs about the talker's identity—his or her social or ethnic background, for example—says the University of Chicago's Howard Nusbaum: "Listeners' expectations can be just as powerful as acoustic cues." —*Nicole Branan*

>> LEARNING

Behave Yourself!

Kids who can control their impulses do better in school

Most people believe that intelligence plays the key role in children's academic achievement. A recent study by Pennsylvania State University researchers, however, found that the ability to self-regulate—to pay attention to a task and inhibit impulsive behavior—was more important than intelligence for early academic success.

The study focused on three- to five-year-olds and showed that preschoolers' capacity for self-control was the best predictor of their performance in math and reading in kindergarten. Scores on intelligence tests were not as closely correlated with academic achievement.

A child's ability to monitor his or her thinking and behavior develops rapidly during preschool. Psychologist Clancy Blair, who led the study, says that the data give concrete support to preschool programs that focus more directly on self-regulation. "Curricula are needed that provide children with regular activities to decrease impulsiveness and instant gratification and that promote attention and awareness of one's own and others' thoughts and feelings," Blair remarks.

Parents interested in boosting their kids' school readiness should engage them in activities that involve taking turns, paying attention for sustained periods and giving incentives for thoughtful responses, the researchers say. —*Dinsa Sachan*

BRENDAN BEIRNE *Getty Images (top)*; CHRISTOPHER BISSELL *Getty Images (bottom)*

BRAINI

- **Pure oxygen,** widely used for resuscitation, may actually harm the brain, according to a new study from the University of California, Los Angeles. Brain scans showed that inhaling pure oxygen for two minutes hindered cerebral blood flow and caused the hypothalamus to flood the bloodstream with chemicals that interfere with the heart's ability to pump. Blending some carbon dioxide into the inhaled gas reduced these harmful effects.

- **Daily meditation** can boost concentration, report investigators at the University of Wisconsin–Madison. When presented with two nearly simultaneous stimuli, most people focus on one and fail to notice the other. People who regularly meditate, however, spent less mental energy on an initial target, which improved their awareness of another that rapidly followed. The results suggest that mental functioning can be enhanced through training.

- **Infants** can distinguish different languages based on facial movements alone. Scientists at the University of British Columbia found that when four- to six-month-olds from English-speaking families watched silent clips of a bilingual speaker, their curiosity was piqued when the language switched. By the age of eight months, only babies from bilingual homes could make the distinction, because over time the brain is honed to recognize only the languages a child experiences frequently.

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>> BEHAVIOR

Trauma in Disguise

A child's hyperactivity may be a symptom of distress

To most children, the picture of Davy Crockett's rifle in their history book is like many aspects of school: boring. For a child who saw his father threaten his mother with a shotgun, however, the picture can trigger traumatic memories—and the resulting fidgeting and jumpiness can look to teachers and doctors like attention-deficit hyperactivity disorder (ADHD). In such cases, standard treatment with stimulants (which help to focus the ADHD brain) may do more harm than good. And according to some experts, misdiagnosis of trauma-related attention problems may not be uncommon: in children, trauma produces different symptoms than it does in adults.

Recent research by Duke University psychiatrists found that by age 16, more than two thirds of children are exposed to at least one potentially traumatic event, such as abuse or a natural disaster. But fewer than 1 percent of the 1,420 children studied met the criteria for post-traumatic stress disorder. In childhood, trauma was more likely to lead to depression, anxiety and behavior problems.

Frank Putnam, a professor of psychiatry at Cincinnati Children's Hospital (who uses the Davy Crockett example in teaching), notes that diagnostic guidelines do not require doctors to rule out trauma when considering ADHD. And yet research shows that trauma profoundly affects attention and activity. Putnam found that abused kids were far more active than their nonabused counterparts—and because potentially traumatic events are common, he believes misdiagnosis may be, too.

Psychiatrist William E. Copeland, lead author of the Duke study, disagrees. He thinks that the rate of such misdiagnosis is "overall extremely low." ADHD criteria require some symptoms to start before age seven, so if an older child's behavior suddenly changes, the diagnosis would not fit. But, he concedes, "there are certain settings where kids are exposed to multiple traumatic events [like foster care], and that's going to be an issue."

Experts such as Putnam are calling for more research to determine how widespread trauma-related ADHD misdiagnosis really is and to figure out how to better help traumatized kids—less than one third of whom, according to Putnam's research, actually need medication. —*Maia Szalavitz*

Medicating kids who are misdiagnosed with ADHD could do more harm than good.

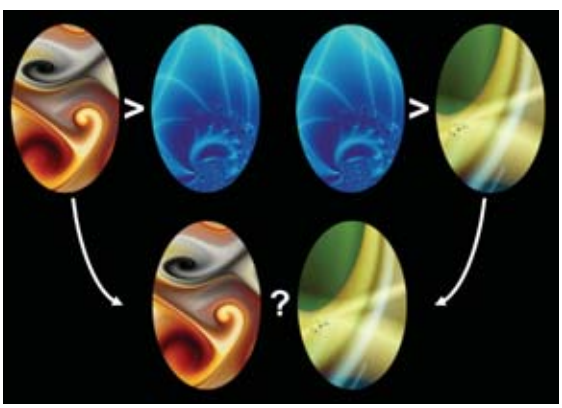
>> MEMORY

Sleep on It

Give your brain a break, and it will find hidden connections

How does your brain manage to see both the trees and the forest? A new study suggests that getting the big picture requires some downtime and, for an extra boost, a night of sleep.

The ability to recognize hidden relations among our memories, a characteristically human feature, is vital for solving problems in creative ways. To understand how this "relational memory" develops, a team of researchers from Harvard Medical School and McGill University presented students with pairs of abstract images in which one image was considered "greater" (*graphic above*), then asked them to guess the hierarchy of the images in new combinations.



Volunteers studied pairs of abstract images (*top row*) to learn which image was "greater" in each pair. After time away, they were tested on the hierarchy in new pairs (*bottom row*).

Subjects tested 20 minutes after the learning period performed no better than chance—their brains had not yet been able to figure out new connections. Those who were tested after at least 12 hours, however, were much more successful in detecting the hidden relations. And participants who had slept during their time away from testing outperformed the other groups in the most difficult inferences.

"The process of binding memories together evolves over time," says neurologist Jeffrey Ellenbogen, a member of the research team. As we sleep or focus on other tasks, our brain forges connections in the background, fitting newly learned information into a bigger picture. One more reason why you should sleep before taking an exam: connecting the dots takes time. —*Graciela Flores*

ANNA PEISL *zefa/Corbis (top)*; JEFFREY ELLENBOGEN (*bottom*)

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>> PSYCHOLOGY

Everyone Agrees

An oft-heard opinion seems popular even if it comes from only one person

With the 2008 presidential election only a year away, the merits of each candidate are becoming a common topic of conversation. But how do our brains, after hearing so many different opinions, gauge the popularity of each one? New research findings suggest that we judge a viewpoint's prevalence by how familiar it is—regardless of whether we have heard it five times from one person or once each from five different people.

Kimberlee Weaver, a psychologist at Virginia Polytechnic University, and her colleagues gave volunteers records of opinions from a fictional focus group that had supposedly met to discuss the preservation of open space in New Jersey. In some cases, multiple people expressed the viewpoints; in others, the same person repeated an opinion many times. Based on these records, they asked the subjects to estimate how the focus group, and the population in general, felt about the matter.

The study participants rated an opinion as popular if it had been expressed several times—even if only one person had said it. The researchers' follow-up experiments suggested that the opinion's familiarity was the most important factor in whether subjects considered it to be common.

"People are not always good at inferring what other people think," Weaver says. The ability to gauge the sentiment of a crowd is vital for good social decision making, and for the most part evolution has honed our skills of perception. But our psychological mechanisms are sometimes subject to constraints—and this phenomenon is a perfect example. According to Weaver, these types of miscalculations could sway our own opinions and perceptions of reality, leading us to unintentionally make decisions influenced by a mentally amplified vocal minority. *—Melinda Wenner*

>> CULTURE

Unspoken Accents

Nonverbal language reveals your roots

Just as an Irish brogue or a Minnesota lilt betrays one's background, facial expressions and body language can also reveal our cultural origins. According to new research, such "nonverbal accents" also provoke stereotyped perceptions of others' personalities.

Many researchers regard nonverbal behavior to be a universal language—wherever you go, a smile looks like a smile. But a growing body of research suggests that where we hang our hats shapes both how we display emotion and how we perceive it in others. In a new study, psychologists Abigail Marsh, Hillary Elfenbein and Nalini Ambady, all then at Harvard University, found that American volunteers could distinguish American from Australian faces when the faces were photographed smiling but not when they were photographed with neutral expressions.

In addition, the way Americans and Australians walked or waved in greeting not only telegraphed their nationality but also triggered prevailing stereotypes about the two groups: Americans were judged more dominant (think, "Carry a big stick") and Australians more likable (think, "G'day, mate!").

A different study, led by psychologist Masaki Yuki of Hokkaido University in Japan, suggests that people from different cultures are attuned to different nonverbal cues. The group found that Americans, who tend to express emotion overtly, look to the mouth to interpret others' true feelings. Japanese, who tend to be more emotionally guarded, give greater weight to the eyes, which are less easily controlled.

"These studies show both that people can be sensitive to cultural cues that they are barely aware of and also that their own cultural norms can lead them astray," comments Judith Hall, who studies nonverbal communication at Northeastern University. For example, "Americans who think the Japanese are unexpressive mistake subtlety for lack of expression. These Americans would misjudge facial cues that Japanese might be very successful at interpreting."

Such misjudgments can have unintended consequences, Marsh argues. "Everyone knows how spoken communication breakdowns can lead to cross-cultural misunderstandings," she says. "These studies highlight the importance of nonverbal communication as well. Improving awareness of these differences might go a long way toward improving cross-cultural interactions." *—Siri Carpenter*

SCOTT MENCHIN *Getty Images (top)*; GETTY IMAGES *(bottom)*

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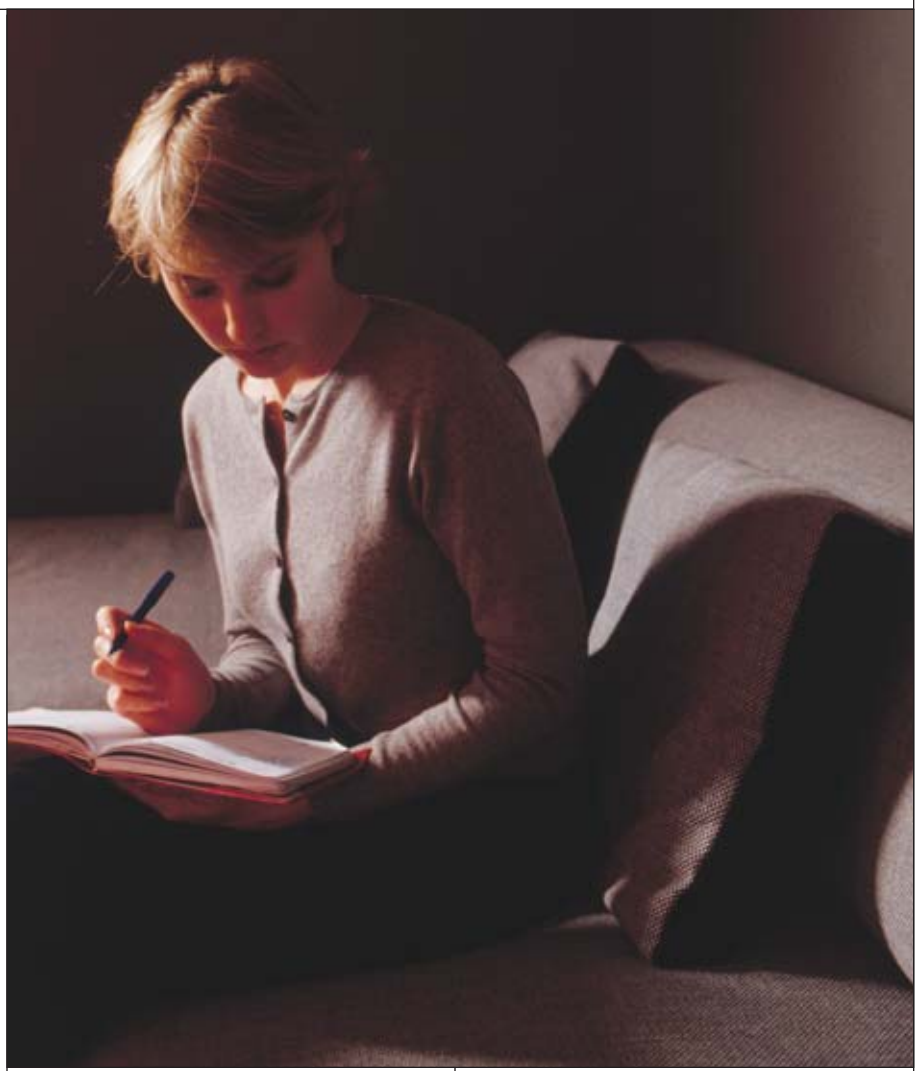
The Power of the Pen

Writing in a diary about a bad situation can help bring about a happy resolution—and maybe even improve your mental health BY KATJA GASCHLER



GHISLAIN AND MARIE DAVID DE LOSSY *Getty Images*

ONE WEDNESDAY MORNING an engineer named Marcus was called into his boss's office. The manager thanked Marcus for his 30 years of service to the firm and handed him his pink slip. A security officer escorted Marcus back to his office to clean out his desk and then to the building's exit. The same thing happened to 100 other engineers that day—the Dallas computer company they worked for laid them off without any notice and sent them on their way.

Psychologist James W. Pennebaker, then at Southern Methodist University, managed to recruit more than half of these men and women to take part in a simple experiment several months after they had been let go. "I have never worked with such a bitter and hostile group of research subjects," remembers Pennebaker, now at the University of Texas at Austin. He asked everyone to spend 20 minutes a day for five consecutive days writing in a diary. Some members of the group were instructed to note how they spent their time each day; a second group was asked to write down their deepest feelings about the loss of their job; and the remaining volunteers were given no writing instruction at all.

The people who ended up in the second group—those who poured out their anger and disappointment onto paper—subsequently experienced a dramatic advantage over their peers in gaining new employment. More than a quarter of them found a new job after three months. Among the other groups, a much smaller percentage found work, even though all the participants expended the same amount of effort in their job hunt and got about the same number of interviews. The results were so striking that Pennebaker and his colleagues terminated the experiment early so they could advise everyone to start writing about their innermost feelings immediately.

That was 1994. Since then, dozens of studies have shown that "expressive writing" can heal the body and soul. In the months after an exercise such as the one in Pennebaker's study, most people—whether they are students, sex criminals or sick patients—feel significantly better, physically and mentally. According to an evaluation of 13 different studies on healthy subjects, the results are at least as beneficial as psychological intervention. And more recent research shows that

(Expressive writing has a long-term **favorable influence** on the immune system and blood pressure.)

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Writers should never force themselves to try to find **hidden meaning** in their suffering.

expressive writing has a long-term favorable influence on the immune system and blood pressure.

The Right Way to Write

Whereas all these findings seem to indicate that picking up a pen is a cure-all for our troubles, it is not quite so simple. It is important to choose the right topics. Researchers agree that positive effects from writing are achieved only when people deal with a negative situation—specifically, a situation that has been bothering them and that they have not been willing to discuss with anyone. And Pennebaker warns that the moment of writing itself can be painful. "I often saw our subjects crying," he says. But releasing blocked emotions—Sigmund Freud called this catharsis—leads, at least in the long run, to healing.

In addition, describing a problem or retelling an experience, rather than merely pondering it, can bring about a change of perspective. In 2006 Sonja Lyubomirsky of the University of California, Riverside, enlisted 96 of her students to evaluate all three of these methods. Only the first two proved therapeutic. Telling stories, whether in writing or out loud, enabled subjects to analyze an event step by step; it provided a beginning and an ending. Merely thinking about it, on the other hand, created chaos: events, images and emotions became intertwined, leading people to relive the experience—with the danger of becoming lost in misery all over again.

Those who profit the most from expressive writing, Pennebaker says, neither skirt the difficult issues nor attempt to minimize them. Sometimes individuals are also able to discover some meaning in their traumatic experiences—but this is just an added bonus, unnecessary for therapeutic benefit. Writers should never force themselves to try to find hidden meaning in their suffering. That could do more harm than good.

To make the most of a writing session, Pennebaker advises people to focus on three questions: What happened? How did I feel about that? Why did I feel that way? And the first commandment is always to feel free: don't worry about grammar, spelling, complete sentences or repetition. None of that matters. According to Pennebaker, "What counts is that you devote at least 15 minutes and delve into your deepest feelings."

But be careful when dealing with positive experiences. Writing about good memories has the opposite effect. In Lyubomirsky's study, when students were asked to produce written analyses of their happiest moments, they actually damaged their positive feelings. Perhaps because writing created a psychological distance from these memories, the students' satisfaction with them ebbed in the weeks that followed. On the other hand, it was useful to indulge in thinking about these happy experiences. Interestingly, short written notes do no harm: in a 2003 study by Robert Emmons of the University of California, Davis, 65 students jotted down five things every week that they were thankful for. The participants blossomed during the experiment, experiencing good moods more often and interacting with their peers in positive ways.

Now, more than a decade after expressive writing helped Pennebaker's frustrated computer engineers find jobs, a growing body of research points to a common and welcome conclusion: no one has to labor for hours over a diary to see positive changes in his or her well-being. Fifteen minutes now and then is plenty—if you are doing it right. M

KATJA GASCHLER is deputy editor in chief of *Gehirn & Geist*.

Expressive Writing Tips

- >> Write about negative experiences, not positive ones.
- >> Spend at least 15 minutes per session.
- >> Focus on your deepest feelings.
- >> Let the words flow: don't worry about spelling or grammar.

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It's All Done with Mirrors

Reflections on the familiar and yet deeply enigmatic nature of the looking glass

BY VILAYANUR S. RAMACHANDRAN AND DIANE ROGERS-RAMACHANDRAN

ERIK VON WEBER *Getty Images*

MIRRORS have held a peculiar fascination for people ever since one of our early hominid ancestors looked at her reflection in a pool and noticed an uncanny correlation between her own muscle movements—sensed internally—and the visual feedback. Even more mysterious—and perhaps not unrelated—is our ability to "reflect" on ourselves as the first introspective primates. This ability displays itself in ways as different as the mythical Narcissus looking at his reflection in a lake to Internet pioneer Jaron Lanier's invention of virtual reality to transport you outside your own body.

Intriguingly, neuroscientists have discovered a new class of brain cells called mirror neurons that let you "adopt another's point of view," both literally and metaphorically ("I see what you mean"). Perhaps such neurons even allow you to look at yourself from another's vantage point, so you become "self conscious" of what you are doing or wearing or even of who you are. It is as if the brain were peering into its own internal mirror.

We take all these abilities for granted, but about a decade ago Eric L. Altschuler and Steve Hillyer of the University of California, San Diego, and one of us (Ramachandran) described a new neurological syndrome called mirror agnosia in which a patient with a small right hemisphere stroke cannot tell that a mirror reflection is not a physical object. Amazingly, these patients will repeatedly try to reach for, pick up or grab the reflection (which they claim is a real item) located in the mirror. Mentally, such patients are otherwise perfectly normal; they continue to have abstract knowledge of mirrors and the nature of their optics. Such patients give us a glimpse into the surreal no-man's-land between reality and illusion, and they help us realize how tenuous our hold on reality is. Mirrors are familiar yet deeply enigmatic.

Mirror Magic (No Smoke)

You can play with mirrors to explore their magic. Begin by constructing the mirror box [*see illustration on opposite page*]. We initially designed this box to treat patients with phantom limbs and stroke (more on this therapy later), but you can have fun experimenting on yourself and your friends. Alternatively, for a quick start, use the swinging, mirror-covered door of a bathroom medicine cabinet or simply prop up a mirror using books or bricks.

Normally our senses, such as vision and proprioception (muscle and joint sense), are in reasonably good concordance. The messages from different senses converge in the angular gyrus and supramarginal gyrus in the parietal lobe, where you construct your "body image." These two gyri were originally fused as one gyrus (the inferior parietal lobule) in apes. Given the importance of intermodality (cross-sensory) interactions, however, in humans the lobule became enormous

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It will feel as if you are looking at **your real left hand**, even though you are not.

and split into two. From such humble beginnings, we evolved into a hairless ape capable of vast technological sophistication—an ape that not only can reach for peanuts but also can reach for the stars.

Let us return to the mirror box. Start with the reflective side facing rightward. Put your left hand on the left side of the mirror, so it is hidden from view, and place your right hand on the right side so that it exactly mimics the posture and location of the hidden left hand. Now look into the mirror at the reflection of your right hand; it will feel as if you are looking at your real left hand, even though you are not.

While looking in the mirror, begin to move both hands synchronously—in circles or by opening and closing your fingers, for example—so that the reflected and hidden hand are in lockstep. Now, here is the clever bit: stop moving just the left (hidden) hand as you continue moving the right hand. Move your right hand *slowly;* rotate or wave it about and wiggle your fingers but keep your left hand still. For a moment you will now *see* the left hand moving but *feel* it remaining still. Most people experience a jolt of surprise; the brain abhors contradictions.

Even more discombobulating: move your hidden left hand while keeping the right one still. This time you get an even bigger jolt when vision and proprioception "clash." Next, while still looking in the mirror, have a friend stroke your right hand with his finger. You will see your "virtual left hand" being stroked—but your actual left hand, behind the mirror, is not being touched. With this peculiar sensory conflict, your left hand may seem to be anesthetized—because you see, but do not feel, the touch.

Another quite different type of incongruence, which we have observed with Altschuler, occurs if you look at your hand through a minimizing (that is, concave) lens (novelty or science museum shops are good places to purchase inexpensive plastic sheets of these lenses). The hand, when viewed through this type of lens, looks much longer and smaller than it should be, which feels odd. But if you now move your hand and wiggle your fingers, the sensation becomes even more paradoxical and spooky. You feel that the hand does not even *belong* to you; you have a temporary out-of-body experience, as if you were manipulating some other person's hand!

Spooky Hand

The same happens if you look down through the lens at your own feet as you walk. They feel long, skinny and rubbery, as if they were detached from you or you were a giant inspecting his own feet. Even our sense of "willing" a hand or leg to move or of being anchored in our body, it turns out, is built on shaky foundations.

Such parlor games are amusing, but they are also of considerable interest both theoretically and clinically. When an arm is amputated, a patient continues to feel its presence vividly, a syndrome called phantom limb. Oddly enough, many patients believe that they can move their phantom freely ("it answers the phone," "it waves goodbye," and so on).

How does this illusory feeling happen? When you move your hand, motor command centers in the front of the brain send a signal out, down the spinal cord to the muscles on the opposite side of the body. At the same time, a copy of the command (like an e-mail cc) goes to the parietal lobe. As we already noted, this area gets both visual and proprioceptive (body-position sense) feedback that can be compared with the motor command, thereby forming a feedback loop to ensure accuracy. If the arm is lost, there is no proprioceptive feedback, but the copy of the command is nonetheless sent to the parietal lobe and sensed by the patient's brain as movements of the phantom.

For reasons we do not fully understand, some patients are unable to move their phantom—they say it is "paralyzed." And often they report that the phantom limb is painful or frozen in a peculiar, unnatural posture.

How can a phantom be paralyzed? It turns out that many of these patients have had a preexisting injury to the nerves that exit the spinal cord and innervate arm muscles, such that the arm was intact but paralyzed. During that phase, every time the premotor cortex in the front of the brain sent a

The mirror box can create the illusion of a restored limb, helping to treat phantom pain.

JASON LEE

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Would it be possible to **"unparalyze" the phantom** by giving the patient visual feedback?

command to move the arm it received visual and proprioceptive feedback saying, "No, it is *not* moving." Eventually this message gets stamped into the brain as a form of "learned paralysis," a kind of memory that is carried over into the phantom.

The Mirror Cure

Would it be possible to "unparalyze" a phantom by giving a patient visual feedback every time he attempted to move his phantom? Would this strategy provide pain relief? In a 1996 paper we described the technique of using the mirror box. The patient "puts" his clenched, paralyzed phantom on one side and his normal hand on the other, then looks in the mirror while performing mirror-symmetric movements (opening and closing the fist, clapping, and so on). The mirror box gives the visual illusion that the phantom has been resurrected and is actually moving in perfect synchrony with the brain's commands.

Incredibly, the phantom also *feels* as if it is moving, and in many patients the cramping sensation goes away for the first time in years. In some patients the phantom vanishes completely and permanently, along with the pain; it is the brain's way of dealing with sensory conflict. (We suggested in that same paper that such procedures may also be helpful for other conditions such as stroke or focal dystonia, a neurological condition that causes involuntary muscle contractions.) These effects on phantoms have now been confirmed in clinical trials on patients and elegantly explored with brain-imaging studies by neuropsychologist Herta Flor of the University of Heidelberg Central Institute of Mental Health in Mannheim, Germany.

Phantom pain is bad enough, but it is uncommon compared with an equally disabling disorder, stroke, which is a leading cause of disability in the U.S. Damage to the fibers that go from the cortex to the spinal cord caused by a vascular lesion can lead to complete paralysis of the opposite side of the body. We wondered if there is a component of learned paralysis in stroke; perhaps the initial swelling and inflammation cause a temporary interruption of signal transmission. This interruption, combined with visual evidence of paralysis, leads to a form of learned paralysis in addition to the real paralysis caused by nerve damage.

In 1999, in collaboration with Altschuler, we turned to the mirror box to treat stroke paralysis. Testing nine patients, we found striking recovery of function, which was remarkable given that stroke paralysis is usually considered incurable. We postulated that multimodal cells (cells hooked up directly to vision, proprioception and motor output—similar to mirror neurons) that had been rendered dormant by the stroke were being revived by the illusory visual feedback from the mirror. This result, too, has been replicated in controlled trials by two independent groups led by psychologist Jennifer A. Stevens, then at Northwestern University and the Rehabilitation Institute of Chicago, and neurologist Christian Dohle of Duesseldorf University Hospital and Godeshoehe Neurological Rehabilitation Center in Germany.

We also know that even though most motor fibers from the cortex cross over to the opposite side of the body (that is, contralateral), some fibers go directly to the same side (ipsilateral). It has long been a puzzle why intact fibers cannot "substitute" for the damaged ones if there is a stroke. Perhaps they are being "recruited" by the use of the mirror. If so, we may conclude that mirrors (and smoke) are not only useful to magicians. They also can reveal deep insights into how the brain integrates different sensory inputs. Equally important, visual feedback—whether from mirrors or virtual reality—can even be clinically useful in promoting recovery of function from neurological deficits that have long been considered incurable. M

VILAYANUR S. RAMACHANDRAN and DIANE ROGERS-RAMACHANDRAN are at the Center for Brain and Cognition at the University of California, San Diego. They serve on *Scientific American Mind*'s board of advisers.

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BLAISE HAYWARD *Getty Images*

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(calendar)

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MUSEUMS/EXHIBITIONS

1 The Mirror and the Mask: Portraiture in the Age of Picasso

Our appearance and character seem to be immutable, fundamental aspects of ourselves. For centuries, artists strove toward capturing their subjects' likenesses in the most lifelike portraits possible. During the course of the 20th century, however, the art of portraiture became heavily influenced by modernist, more emotionally expressive movements and by major historical events of the age. In this exhibit, drawings, paintings and sculptures by van Gogh, Matisse and Bacon, among others, reveal how they viewed and interpreted their family, friends and selves in the context of a rapidly modernizing world.

Kimbell Art Museum
Fort Worth, Tex.
Through September 16
817-332-8451
www.kimbellart.org/exhibitions/mirror_and_mask.cfm

2 Mysteries of the Mind: Pathways into Hope

Developed in collaboration with psychologists at the University of Arkansas, the exhibit promotes awareness, understanding and tolerance of mental illness. Visitors can learn about the causes of mental disorders through an interactive timeline, starting with historical perspectives and culminating in modern-day scientific understanding. Exhibit activities include a video game that shows its players what it might be like to have an attention, perception or learning disorder.

Museum of Discovery
Little Rock, Ark.
Permanent exhibit
800-880-6475
www.amod.org
http://pibhs.uams.edu/programs/Programs_museum.asp

CONFERENCES

115th Annual Convention of the American Psychological Association

Join thousands of eminent psychologists as they reveal the latest research on behavior and mental health. Volunteer for community outreach activities such as feeding the homeless and partake in the diverse cultural offerings of the city by the bay. Continuing education classes for professionals and dozens of lectures by leading psychologists are also on the program.

San Francisco
August 17–20
www.apa.org/convention07

39th Annual General Meeting of the European Brain and Behavior Society

Neuroscientists from around the world will gather in the shadow of Miramare Castle for this yearly meeting, which aims to bring together all types of research on brain and behavior. A wide range of symposiums highlights topics such as animal memory, childhood ADHD and the way experience shapes the brain and behavior.

Trieste, Italy
September 15–19
www.ebbs-science.org

MOVIES

3 Charlie Bartlett

After failing to fit in at his new public school, rich kid Charlie Bartlett (Anton Yelchin) finally finds his niche by becoming an amateur psychiatrist to his classmates—dishing out both advice and prescription medication. The only opponent to his newfound popularity is the school principal (Robert Downey, Jr.), who suspects Bartlett of drug dealing and despises him for dating his daughter. Despite the movie's heavy message about teenage drug abuse, critics have hailed the film as light, funny and compelling.

MGM
Wide release August 3
www.mgm.com/movies.php

I Want Someone to Eat Cheese With

Jeff Garlin of *Curb Your Enthusiasm* fame plays James, an overweight, out-of-work actor who struggles with his diet almost as much as he struggles with women. One day, after giving up on Compulsive Eaters Anonymous, he seeks solace in an ice cream parlor and meets Beth (Sarah Silverman), a slightly crazy, sexually aggressive counter girl who might be able to cure James's disillusionment with more than just free desserts.

IFC First Take
Limited release September 21
www.ifcfilms.com

WEB SITES/PODCASTS

4 The Archives of the History of American Psychology

A service of the University of Akron, this resource serves as both an academic research library and a public portal into psychology's origins. The site hosts a photo gallery of the organization's large instrument and apparatus collection, which features equipment used by psychologists in the 20th century.

www3.uakron.edu/ahap

Shrink Rap Radio

Every week psychology professor David Van Nuys of Sonoma State University interviews a leading psychologist about his or her specialty, covering a broad range of topics from mental health to spirituality and even business leadership. The animated discussions often delve into the personal lives of the host and guests, offering listeners a rare glimpse of the people behind the science.

http://shrinkrapradio.com

CogSci Librarian

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The New Psychology of Leadership

Recent research in psychology points to secrets of effective leadership that radically challenge conventional wisdom

By Stephen D. Reicher, S. Alexander Haslam and Michael J. Platow

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"Today we've had a national tragedy," announced President George W. Bush, addressing the nation for the first time on September 11, 2001. "Two airplanes have crashed into the World Trade Center in an apparent terrorist attack on our country." Bush then promised "to hunt down and to find those folks who committed this act." These remarks, made from Emma T. Booker Elementary School in Sarasota, Fla., may not seem extraordinary, but in subtle ways they exemplify Bush's skill as a leader. When viewed through the lens of a radical new theory of leadership, Bush's 9/11 address contains important clues to how the president solidified his political power in his early months and years in office.

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Leaders are most effective when they can induce followers to see the group's interest as their own interest.

In the past, leadership scholars considered charisma, intelligence and other personality traits to be the key to effective leadership. Accordingly, these academics thought that good leaders use their inborn talents to dominate followers and tell them what to do, with the goal either of injecting them with enthusiasm and willpower that they would otherwise lack or of enforcing compliance. Such theories suggest that leaders with sufficient character and will can triumph over whatever reality they confront.

In recent years, however, a new picture of leadership has emerged, one that better accounts for leadership performance. In this alternative view, effective leaders must work to understand the values and opinions of their followers—rather than assuming absolute authority—to enable a productive dialogue with followers about what the group embodies and stands for and thus how it should act. By leadership, we mean the ability to shape what followers actually *want* to do, not the act of enforcing compliance using rewards and punishments.

Given that good leadership depends on constituent cooperation and support, this new psychology of leadership negates the notion that leadership is exclusively a top-down process. In fact, it suggests that to gain credibility among followers, leaders must try to position themselves among the group rather than above it. In his use of everyday language—such as "hunt down" and "those folks"—Bush portrayed himself on 9/11 as a typical American able to speak *for* America.

According to this new approach, no fixed set of personality traits can assure good leadership because the most desirable traits depend on the nature of the group being led. Leaders can even select the traits they want to project to followers. It is no accident, then, that Bush has often come across to Americans as a regular guy rather than as the scion of an elite East Coast Yale University dynasty.

But far from simply adopting a group's identity, influential presidents or chief executives who employ this approach work to shape that identity for their own ends. Thus, Bush helped to resolve the mass confusion on 9/11 in a way that promoted and helped to forge a new national unity. Among other things, people wondered: Who or what was the target? New York? Washington? Capitalism? The Western world? Bush's answer: America is under attack. By establishing this fact, he invoked a sense of a united nation that required his leadership.

From Charisma to Consensus

Nearly 100 years ago the renowned German political and social theorist Max Weber introduced the notion of "charismatic leadership" as an antidote to his grim prognosis for industrial society. Without such leadership, he forecast, "not summer's bloom lies ahead of us, but rather a polar night of icy darkness and hardness." Since then, the notion of charisma has endured, alternatively attracting and repelling us as a function of events in the world at large. In the chaos following World War I, many scholars continued to see strong leaders as saviors. But in the aftermath of fascism, Nazism and World War II, many turned against the notion that character determines the effectiveness of leaders.

Instead scholars began to favor "contingency models," which focus on the context in which leaders operate. Work in the 1960s and 1970s by the influential social psychologist Fred Fiedler of the University of Washington, for example, suggested that the secret of good leadership lies in discovering the "perfect match" between the individual and the leadership challenge he or she confronts. For every would-be leader, there is an op-

FAST FACTS

How to Lead

1» A new psychology of leadership suggests that effective leaders must understand the values and opinions of their followers—rather than assuming absolute authority—to enable a productive dialogue with team members about what the group stands for and thus how it should act.

2» According to this new approach, no fixed set of personality traits can assure good leadership because the most desirable traits depend on the nature of the group being led.

3» Leaders who adopt this strategy must try not only to fit in with their group but also to shape the group's identity in a way that makes their own agenda and policies appear to be an expression of that identity.

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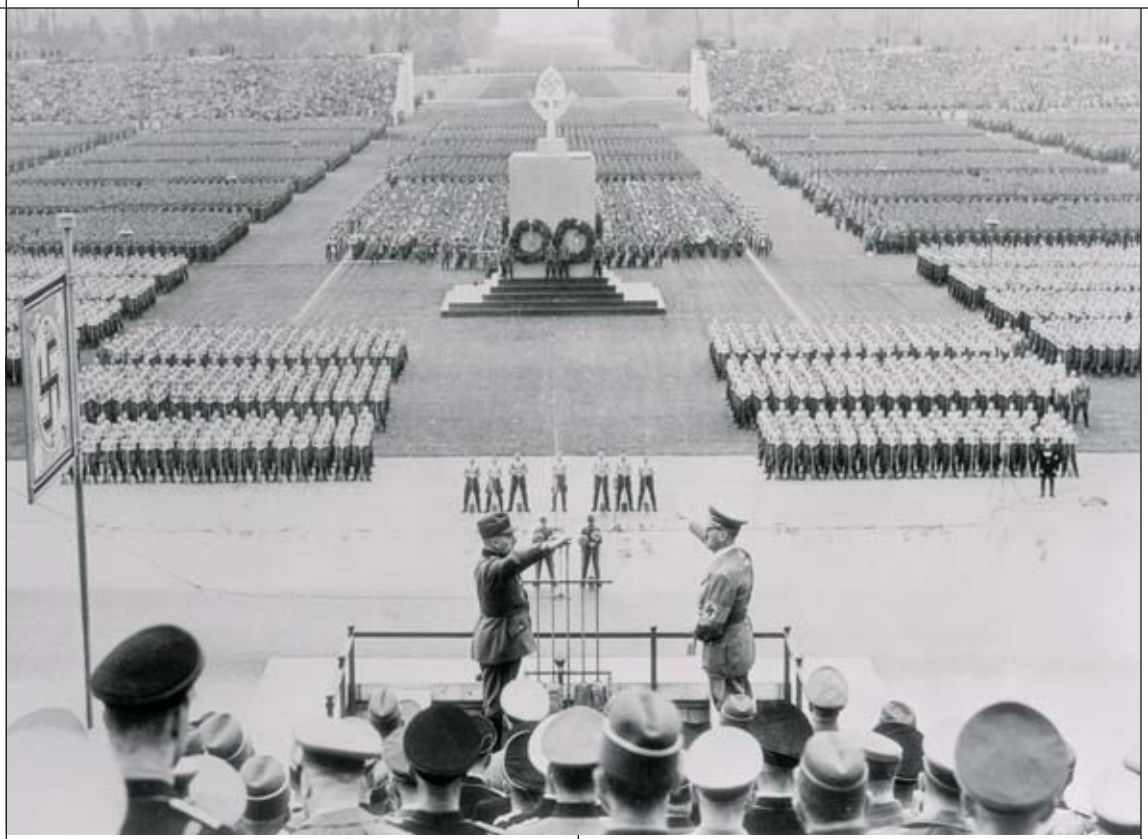

Before Adolf Hitler's reign, people yearned for strong leadership. After Hitler, they dreaded it.

BETTMANN/CORBIS

timal leadership context; for every leadership challenge, there is a perfect candidate. This idea has proved to be a big moneymaker; it underlies a multitude of best-selling business books and the tactics of corporate headhunters who promote themselves as matchmakers extraordinaire.

In fact, such models have delivered mixed results, contributing to a partial resurgence of charismatic models of leadership in recent decades. In particular, James MacGregor Burns's work on transformational leadership in the late 1970s rekindled the view that only a figure with a specific and rare set of attributes is able to bring about necessary transformations in the structure of organizations and society.

How, then, do we get beyond this frustrating flip-flop between those who argue that a leader can overcome circumstances and those who retort that circumstances define the leader? In our view, strong leadership arises out of a symbiotic relationship between leaders and followers within a given social group—and hence requires an intimate understanding of group psychology.

In the 1970s Henri Tajfel and John C. Turner, then at the University of Bristol in England, performed seminal studies on how groups can restructure individual psychology. Tajfel coined the term "social identity" to refer to the part of a person's sense of self that is defined by a group. As Turner pointed out, social identity also allows people to identify and act together as group members—for example, as Catholics, Americans or Dodgers fans. Social identities thus make group behavior possible: they enable us to reach consensus on what matters to us, to coordinate our actions with others and to strive for shared goals.

Tajfel and Turner's original social identity framework does not refer to leadership explicitly, but it helps to clarify why leadership requires a common "us" to represent. Leadership theorist Bernard Bass of Binghamton University has shown, for example, that leaders are most effective when they can induce followers to see themselves as group members and to see the group's interest as their own interest.

The emergence of social identity helps to explain the transformation in the strategies of rulers associated with the birth of modern nation states in the 19th century. According to historian Tim Blanning of the University of Cambridge, before national identities emerged European monarchs could only rule as autocrats, using power (rather than true leadership) to control people. But once people identified with nations, effective monarchs needed to rule as patriots who were able to lead the people because they embodied a shared national identity. Monarchs such as Louis XVI of France who misunderstood or ignored this shift literally lost their heads.

More recently, we affirmed the importance of

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social identities for leadership in an experiment we called the BBC Prison Study, an investigation of social behavior conducted within a simulated prison environment [see "The Psychology of Tyranny," by S. Alexander Haslam and Stephen D. Reicher; SCIENTIFIC AMERICAN MIND, October 2005]. We randomly assigned volunteers to two groups: prisoners and guards. Surprisingly, we found that meaningful and effective leadership emerged among the prisoners but not among the guards, because only the prisoners developed a strong sense of shared social identity based on a common desire to resist the guards' authority. The guards, on the other hand, lacked a group identity, in part because some of them were not comfortable being in a position of authority; accordingly, they did not develop effective leadership and ultimately collapsed as a group.

One of the Gang

When a shared social identity exists, individuals who can best represent that identity will have the most influence over the group's members and be the most effective leaders. That is, the best leaders are prototypical of the group—they not only seem to belong to it but also exemplify what makes the group distinct from and superior to rival groups. For example, Bush was connecting with Middle America—intentionally or otherwise—when he littered his speeches with verbal gaffes, something that columnist Kevin Drum suggested in the *Washington Monthly* worked in Bush's favor in the 2004 election. Indeed, those who scoffed at Bush's awkward utterances suffered, because their criticism cast them as an alien elite out of touch with most ordinary Americans.

Even the way leaders dress can help them appear representative of the groups they lead. Bush's leather jackets and cowboy clothes round out the image of him as a regular guy. In the same vein, the late Palestinian leader Yasser Arafat adopted the headscarf of the peasantry to identify himself with his people. The founder of Pakistan, Muhammad Ali Jinnah, wore a dress made of distinctive items from the various regions of the new country, suggesting a newly unified national identity and establishing himself as its figurehead.

Such examples counter the notion that leadership requires a particular set of personality traits or that leaders should behave in a fixed way. The most desirable traits and actions have to fit with the culture of the group being led and thus vary from group to group. Even some of the most oft-touted leadership traits, such as intelligence, can be called into question in some settings. Some people consider being down-to-earth or trustworthy as more important than being brilliant, for instance. Where this is the case, being seen as too clever may actually undermine one's credibility as a leader, as Bush's tactics suggest.

Followers may also shun an otherwise desirable trait such as intelligence if doing so helps the group differentiate itself from competitors. In a study published in 2000 by Turner, now at the Australian National University, and one of us (Haslam), we asked business students to choose

Dictators or True Leaders?

At the very heart of contemporary thought lies a profound ambivalence toward leaders. At times, they are seen as the hope of humanity—having the capacity to inject energy and romance into jaded societies. The long shadow of Adolf Hitler reinforced an alternative view of strong leaders: far from saving humankind, they were considered the gravest threat to morality and security. Thus, instead of celebrating the emergence of "great men," it seemed that we should be working out ways to inoculate ourselves against them.

Despite this dichotomy, neither the enlightened nor dark rulers of this autocratic genre are true leaders by our definition. Dictators, like early monarchs, can shape the behavior of even the most disparate collection of people using repression or rewards to secure assent or encourage compliance. But such "leadership" succeeds only when followers are under surveillance—say, when a boss watches over his or her employees or the military enforces a leader's wishes. Such a strategy works against group members' will and thus is not leadership proper but coercion.

When we refer to leadership, we mean the ability to motivate people to act in concert—something that requires an internalized social identity [*see main story*]. This type of leadership is effective even when followers are not being watched; that is, they do the boss's bidding even when the boss is away. *—S.D.R., S.A.H. and M.J.P.*

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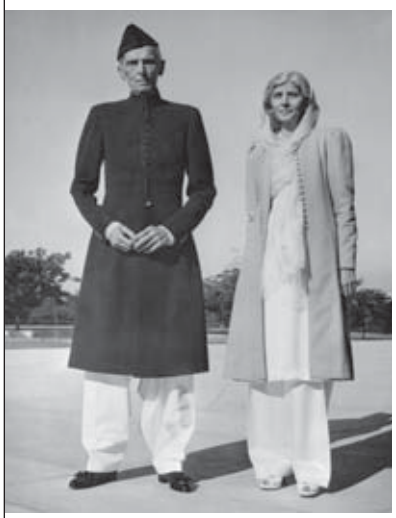
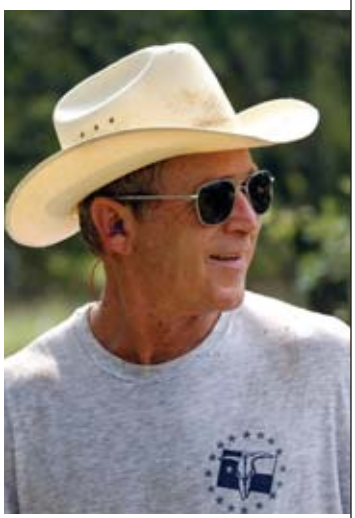
Anything that **sets leaders apart** from the group can compromise their effectiveness.





Leaders such as Muhammad Ali Jinnah, the founder of Pakistan (*left*), Palestinian leader Yasser Arafat (*center*) and President George W. Bush (*right*) have often dressed in ways that make them appear prototypical of the people they lead.

BETTMANN/CORBIS (*left*); MICHAEL WILLIAMS Zuma/Corbis (*center*); GETTY IMAGES (*right*)

the ideal characteristics for a business leader. When the students were confronted with a rival group that had an intelligent leader (who was also inconsiderate and uncommitted), the students wanted their leader to be *un*intelligent (but considerate and dedicated). But when the rival leader was unintelligent, virtually nobody wanted an unintelligent leader.

If fitting in is important for gaining influence and control, then anything that sets leaders apart from the group can compromise their effectiveness. Acting superior or failing to treat followers respectfully or listen to them will undermine a leader's credibility and influence. Similar problems can emerge if a leader and followers are separated by a wide compensation gap. Financier J. P. Morgan once observed that the only feature shared by the failing companies he worked with was a tendency to overpay those at the top.

Another experiment of ours, which we reported in 2004, confirms Morgan's wisdom. We created work teams in which leaders' remuneration was either equal to, double or triple that of followers. Although varying the remuneration structure did not affect the leaders' efforts, team members' efforts diminished markedly under conditions of inequality. As the late Peter F. Drucker, then professor of management at Claremont Graduate University, wrote in his book *The Frontiers of Management* (Dutton, 1986), "Very high salaries at the top … disrupt the team. They make … people in the company see their own top management as adversaries rather than as colleagues.... And that quenches any willingness to say 'we' and to exert oneself except in one's own immediate self-interest."

Favoring Fairness

Another reason not to lavishly compensate those at the top is that followers are likely to perceive such financial inequity as unfair. Followers generally respect fairness in leaders, although what fairness means can depend on the followers. Ways to be fair as a leader include refraining from helping yourself and making sacrifices for the group. Gandhi won people over by adopting an Indian villager's dress, which symbolized his refusal of luxuries; Aung San Suu Kyi similarly attracted supporters with her willingness to endure ongoing house arrest to promote collective resistance to military rule in Myanmar (Burma).

Effective leaders can also display fairness in the way they resolve disputes among group members. Favoritism, or even the appearance of it, is the royal road to civil war in organizations, political parties and countries alike. In some cases, however, leaders should favor those who support

(The Authors)

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Followers generally respect fairness in leaders, although what passes for fairness depends on the followers.

their own group (the in-group) over those who support another group (the out-group).

In a 1997 study conducted by one of us (Platow) in New Zealand, people endorsed the leadership of a health board CEO who allocated time on a kidney dialysis machine equally between two fellow New Zealanders. Yet when the CEO had to split the time between a New Zealander and a foreigner, people liked the leader who gave more time to the in-group member. And in a 2001 study we asked Australian undergraduates about their support for a student leader, Chris, who had distributed rewards between student council members who were known to either support or oppose core student positions (regarding cuts to university funding, for example). Chris was more popular to the extent that he showed a preference for the council members who supported the in-group position. And when Chris showed such partiality, the undergraduates were more likely to back him and devise ways to make his proposed projects succeed [*see box below*].

People do not always prefer leaders who are biased against the out-group, however. A leader who represents a group that holds a strong belief in equality must treat in- and out-group members equally. Thus, when a member of the British Parliament recently put British families before migrants in allocating public housing for those in need, charitable groups, religious groups and socialist groups all protested strenuously. Good leadership does not mean applying universal rules of behavior but rather understanding the group to be led and the types of actions it esteems and considers legitimate.

Wielding Words

But, of course, leadership is not simply a matter of conforming to group norms. Anyone who is in the business of mobilizing people—whether to get them to the polls, to the office or to protest an injustice—must also work to shape and define those norms. Presidents and other leaders most often mold social identities through words, as Bush did in his 9/11 address.

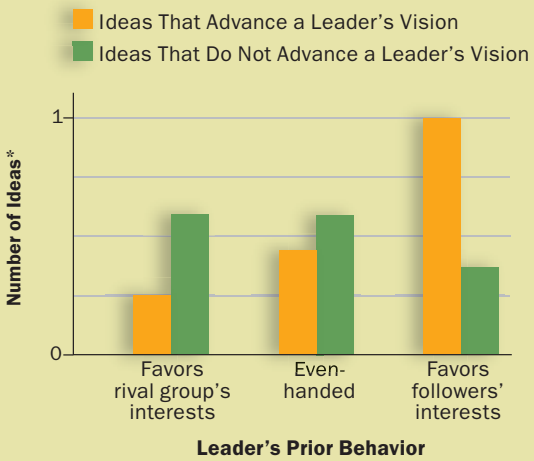
The most effective leaders define their group's social identity to fit with the policies they plan to promote, enabling them to position those policies as expressions of what their constituents already believe. In the Gettysburg Address, which begins, "Fourscore and seven years ago our fathers brought forth upon this continent a new nation, conceived in Liberty, and dedicated to the proposition that all men are created equal," Abraham Lincoln strongly emphasized the principle of equality to rally people around his key policy objectives: unification of the states and emancipation of the slaves.

In fact, the Constitution contains many principles, and no one stands above all others, according to historian Garry Wills in his Pulitzer Prize–winning book, *Lincoln at Gettysburg: The Words That Remade America* (Simon & Schuster, 1992). Nevertheless, Lincoln elevated equality to a position of supreme importance and made it the touchstone of American identity. After Lincoln's address, Americans interpreted the Constitution in a new way. As Wills writes of the Gettysburg audience: "Everyone in that vast throng of thousands was having his or her intellectual pocket picked. The crowd departed with a new thing in its ideological luggage, that new constitution."

This reshaping of American identity as centered on equality allowed Lincoln to unite and

Follow the Leader

Followers generate ideas that advance a leader's vision—that is, they display "followership"—only if that leader has in the past advanced the interests of the group. If the leader has been either evenhanded or supportive of rival groups or positions, followers' ideas are unhelpful.



*Averaged across a large number of participants.

SOURCE: "THE LINK BETWEEN LEADERSHIP AND FOLLOWERSHIP: HOW AFFIRMING SOCIAL IDENTITY TRANSLATES VISION INTO ACTION," BY S. A. HASLAM AND M. J. PLATOW, IN *PERSONALITY AND SOCIAL PSYCHOLOGY BULLETIN*, VOL. 27, NO. 11; 2001

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Abraham Lincoln refocused American identity around equality—just one of the principles in the U.S. Constitution—to rally people around his policy of emancipation.

BETTMANN/CORBIS (*left*); TETRA IMAGES/CORBIS (*right*)

mobilize Americans around freeing the slaves—a previously divisive issue. Through his skills as a wordsmith, this supreme entrepreneur of identity secured one of the greatest achievements in American history.

Identities and Realities

If Lincoln's definition of American identity moved people to create a more equal society, then the realities of emancipation served to reinforce equality as the core of American identity. That is, there is a reciprocal relation between social identity and social reality: identity influences the type of society people create and that society in turn affects the identities people adopt.

An identity that is out of kilter with reality and that has no prospect of being realized, on the other hand, will soon be discarded in favor of more viable alternatives. Our BBC Prison study provided a stark warning as to what happens if a leader's vision is not accompanied by a strategy for turning that vision into reality. In this study the collapse of the guard system led participants to set up a commune whose members believed passionately in equality. But the commune's leaders failed to establish structures that either promoted equality or controlled those who challenged the system. In the end, the commune also tottered, and the enduring inequality led even the most committed to lose faith. They began to believe in a hierarchical world and turned to a tyrannical model of leadership that would bring their vision into being.

The wise leader is not simply attuned to making identities real but also helps followers experience identities as real. In this vein, rituals and symbols provide perspective by reproducing a dramatized representation of the world in miniature. In her book *Festivals and the French Revolution* (reprinted by Harvard University Press in 1991), Mona Ozouf, director of research at the French National Center for Scientific Research, writes that the revolutionaries fashioned a whole new set of festivals to symbolize a France based on "liberty, equality, fraternity." In the past, people had paraded according to social rank, but now rich and poor paraded together, organized by age instead. In contrast, Adolf Hitler choreographed his Nuremberg rallies to portray an authoritarian society. He started among the masses, but at a strategic moment he would ascend a podium from where he could talk down to the serried and orderly ranks.

No matter how skilled a person might be, however, a leader's effectiveness does not lie entirely in his or her own hands. As we have seen, leaders are highly dependent on followers. Do followers see their leader as one of them? Do followers find their leader's visions of identity compelling? Do followers learn the intended lessons from rituals and ceremonies? Our new psychological analysis tells us that for leadership to function well, leaders and followers must be bound by a shared identity and by the quest to use that identity as a blueprint for action.

The division of responsibility in this quest can vary. In more authoritarian cases, leaders can claim sole jurisdiction over identity and punish anyone who dissents. In more democratic cases, leaders can engage the population in a dialogue over their shared identity and goals. Either way, the development of a shared social identity is the basis of influential and creative leadership. If you control the definition of identity, you can change the world. M

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NEW Brain Cells Go to Work

How newborn neurons soon join the existing tightly knit networks of brain cells

By R. Douglas Fields

Science oft resembles the federal tax code: the rules are rigid, but they also keep changing. So it has been with the study of neurogenesis, or the creation of neurons in the human brain. Not long ago a hard-and-fast rule held that neurons could neither divide nor emerge from elsewhere. The neurons you were born with, in short, were the ones you took to your grave. That dogma began to change in the 1980s, however, when Fernando Nottebohm of the Rockefeller University discovered that neurons were dividing in the forebrains of canaries. It appeared that neurons divided after all.

RALPH MERCER *Getty Images*

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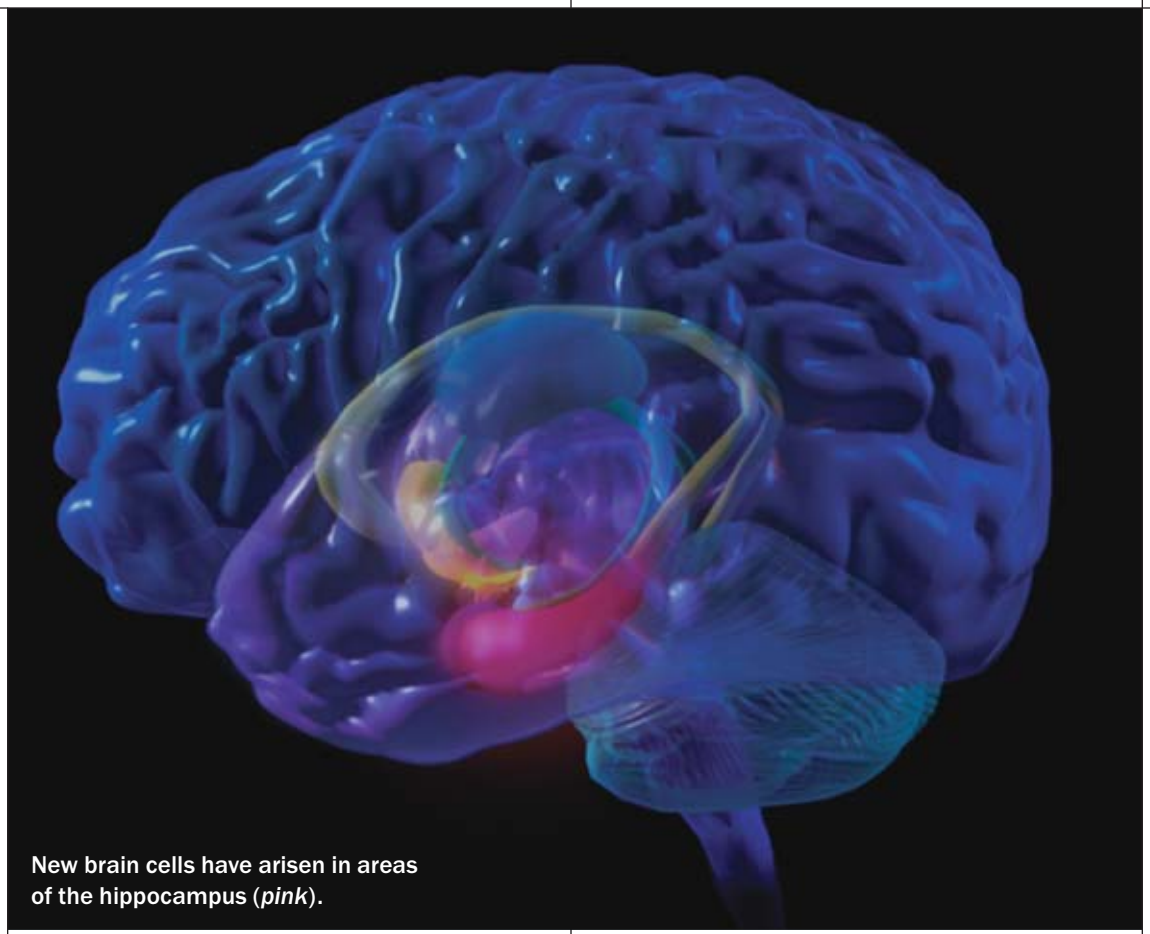

New brain cells have arisen in areas of the hippocampus (*pink*).

CAROL DONNER *Phototake*

Neuroscientists resisted this idea at first. It clashed with all established facts and belief. But slowly the accumulation of data moved minds. Now newborn brain cells are popping up in studies like mushrooms after rain. Scientists have even found that neurogenesis increases after physical exercise—a great relief to baby boomers who fried too many brain cells in college. The latest research shows that new neurons are hatching in the most hallowed of all brain regions, the hippocampus, the seat of declarative and spatial memory. These discoveries raise the prospect that we might learn to manipulate neurogenesis to relieve ailments such as stroke and cognitive decline.

Skeptical scientists, however, have met all this news with an important question: What use are new neurons if they do not somehow wire themselves into the existing circuitry of the brain—and how are these inexperienced neurons going to do that? The difficulty of incorporating new cells into the intricate, tightly woven fabric of neural connections in the grown-up brain was always one of the stronger arguments against the existence of new neurons in the first place. What good are these cellular neophytes if they merely become passive bystanders?

In the past few years, however, findings from several labs have shown that new neurons do connect with existing circuitry. A recent paper by neuroscientists Nohjin Kee, Cátia M. Teixeira and their colleagues at the University of Toronto contributes a key piece of evidence. It shows that new neurons indeed integrate themselves into functional networks in the hippocampus and

FAST FACTS

The New Neurogenesis

1» For many years, scientists believed that the brain did not generate new neurons after birth. Now neurogenesis has become accepted.

2» But what good are new brain cells if they cannot become part of long-established neural networks? The question remained open for some time.

3» Now new neurons have been found to connect with existing circuitry. They may boost memory or at least participate in making new memories.

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that these new recruits actually boost memory—or at least participate in making new memories. It is perhaps the clearest demonstration yet that new neurons join existing teams and do real work. How did researchers crack that nut?

The discovery required a microscope, a tank of water and a mutant mouse.

The Swim Test

First, some memory basics. Memories are not held inside neurons, the brain's cells. Rather they are set in the connections between neurons, called synapses—tiny gaps across which the signal-emitting finger of one neuron (an axon) sends a message to the signal-receiving finger of another neuron (a dendrite). Memories are created when nerve cells in a circuit increase the strength of their connections.

Mice learn to find a submerged platform in a water maze, a standard memory test.

Kee and his fellow researchers first trained mice in a standard memory test device called a Morris water maze. This test consists of plunking a mouse in a vat of milky water in which a small platform is hidden somewhere just below the surface. The mouse swims in a highly motivated manner until it finds the submerged life preserver, where it can stand comfortably with its head above water.

If placed in the tank again, the mouse remembers the platform's location and swims to it pronto. With subsequent trials the mouse gets really good at finding the platform quickly. The mouse thus demonstrates learning—specifically, spatial learning, given that the rodent cannot see the platform but must remember its location by using landmarks placed on the tank walls or suspended overhead. (Incidentally, this test works well because mice are good swimmers and take naturally to the challenge.) Synapses are strengthened when the animal is subjected to the stressful or cognitively challenging experience of finding its way to the platform.

To make memories stick, neurons must turn on genes to manufacture proteins that will cement more strongly the synapses shared among them. The molecules that establish current flow around synapses, as with all proteins in the body, degenerate and are replaced constantly over a period of hours or days. Scientists have known since the 1960s that turning on genes was somehow involved in making memories permanent, because genes tell cells to produce proteins, and new proteins must be synthesized in the neural networks within minutes of an experience for it to be coded in memory.

After training mice in this water task, Kee and his colleagues looked to see if the task switched on learning-associated genes in new hippocampal neurons. They knew they were looking at new neurons because they had injected the mice with a marker for dividing cells—one of the DNA bases that has been chemically modified so that it shows up in tissue slides under a microscope. Because cells must make DNA to divide, newly minted cells carry this fluorescent marker (bromodeoxyuridine) in their nuclei. When Kee and his team looked through the microscope at the hippocampus of mice that had learned to find the platform, they indeed found that certain "memory" genes known as *c-fos* and

Each week in Mind Matters, www.sciammind.com's expert-written "blog seminar," researchers of mind and brain explain and discuss their disciplines' most notable recent findings. In this installment, R. Douglas Fields and Brad Aimone ponder the discovery that newborn brain cells can join existing neural networks.

Mind Matters examines a new finding every week. Join the discussion at www.sciammind.com

(The Author)

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JINAH CHOI

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Growing in Stages

By Brad Aimone

As R. Douglas Fields notes in the main article, the biggest question currently facing neurogenesis researchers is, What are these new neurons doing? Although the existence of new neurons in the hippocampus suggests a role in memory formation, the prevailing cautious hypothesis has been that these cells simply replace dying cells or that they are just a functionless evolutionary artifact—an "appendix" of sorts in the brain.

The work done by neuroscientists Nohjin Kee, Cátia M. Teixeira and their colleagues at the University of Toronto, however, supports the idea that these neurons perform a meaningful function. The Kee study does not aim to show the exact role of these new cells, but it does further demonstrate that the animal's experience can make these neurons functionally distinct from the existing population of brain cells. Because the young neurons are more likely to respond in this manner than fully mature cells are, it is difficult to imagine that they are simply replacing dying parts of the circuit.

So what is the ultimate function of these new neurons? One possibility is that they serve several different roles as they mature. For instance, in a study last year on the potential role for adult neurogenesis in the encoding of time in new memories, several of my colleagues at the Salk Institute for Biological Studies and I proposed that immature neurons may respond somewhat indiscriminately to different events occurring around the same time, thereby contributing temporal information to new memories.

Yet that hypothesis addresses only the role of these neurons as they mature; it does not account for newborn neurons that survive longer and respond to specific information months later, as shown in the Kee study. These longer-lasting neurons may have a temporally restricted function, such as time coding, early in their development and then narrow their role so that later they respond only to a specific type of information. This idea is consistent with the timeline of new neuron learning described in the Kee paper—the neurons begin to integrate into existing networks during the first several weeks after they are born, but only later do they appear to encode the spatial information acquired during training.

Regardless of whether new neurons encode time, spatial maps, or something else entirely, ultimately we will need to see a behavioral difference in animals in which the capacity for neurogenesis has been removed to fully understand the function of these new cells. Beyond the technical difficulties involved in reducing the number of new neurons, the big challenge is to determine what types of deficits we should begin to look for in these animals—and when we should look for them. The Kee study provides some valuable clues for these questions.

Brad Aimone is a graduate student in the Computational Neurobiology Program at the University of California, San Diego. He is investigating adult neurogenesis in the laboratory of Fred Gage at the Salk Institute for Biological Studies.

(Like impressionable children, new neurons were more likely than adult neurons to participate in learning.)

arc were turned on in many of the new neurons. Nevertheless, as Kee knew, it is possible for these genes to get turned on by forms of mental stimulation other than learning. How would they know these new neurons were actually storing memories of where the submerged platform was hidden?

The Control

Enter the mutant mouse. As a control, Kee and his co-workers also put through the water maze a mouse that had a disabling mutation in an enzyme (CaMKII) that is essential for making memories. This mouse could find the platform, but it could not carry the memory to the next test; it had to find the platform afresh every time. As it turned out, its hippocampus had as many newborn neurons as that of the more learned mice, but its memory gene, *c-fos*, was not switched on any more than it was in control animals that had not been trained. The memory gene's activation seemed to be what made the learning possible.

The researchers also found that by training the mice at different time intervals after the bromodeoxyuridine injection they could determine just how old the new neurons had to be before they joined the adult circuits of memory storage. They found that new neurons are not involved in memory until they reach the age of about four to

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Four-week-old neurons in the hippocampus of a mouse reveal themselves by expressing a green fluorescent marker protein.

SEBASTIAN JESSBERGER *Salk Institute for Biological Studies*

six weeks. Yet, like impressionable children, these new neurons were actually more likely to participate in learning than were the adult neurons already established in networks.

The study might have been stronger if the team had used an additional mutant of a different type or various drugs to interfere with memory [see "Erasing Memories," by R. Douglas Fields; SCIENTIFIC AMERICAN MIND, December 2005] instead of using only the CaMKII mutant mouse. This is because this enzyme is involved in turning on the *c-fos* gene for reasons unrelated to memory formation. Also, the researchers did not report whether or not the gene more closely associated with memory, *arc*, was switched on in the mutant mice.

Yet the experiment carries substantial weight. It shows that although most neurons in the adult brain do not divide, about 1 to 2 percent of the population at any given time is new in parts of the brain, including the hippocampus. It now seems clear that these new neurons are preferentially recruited into brain circuits that record new spatial memories. But the reasons for this recruitment—and how plugging new neurons into existing circuits might affect old memories—remain about as opaque as the instructions for the federal 1040 tax form. M

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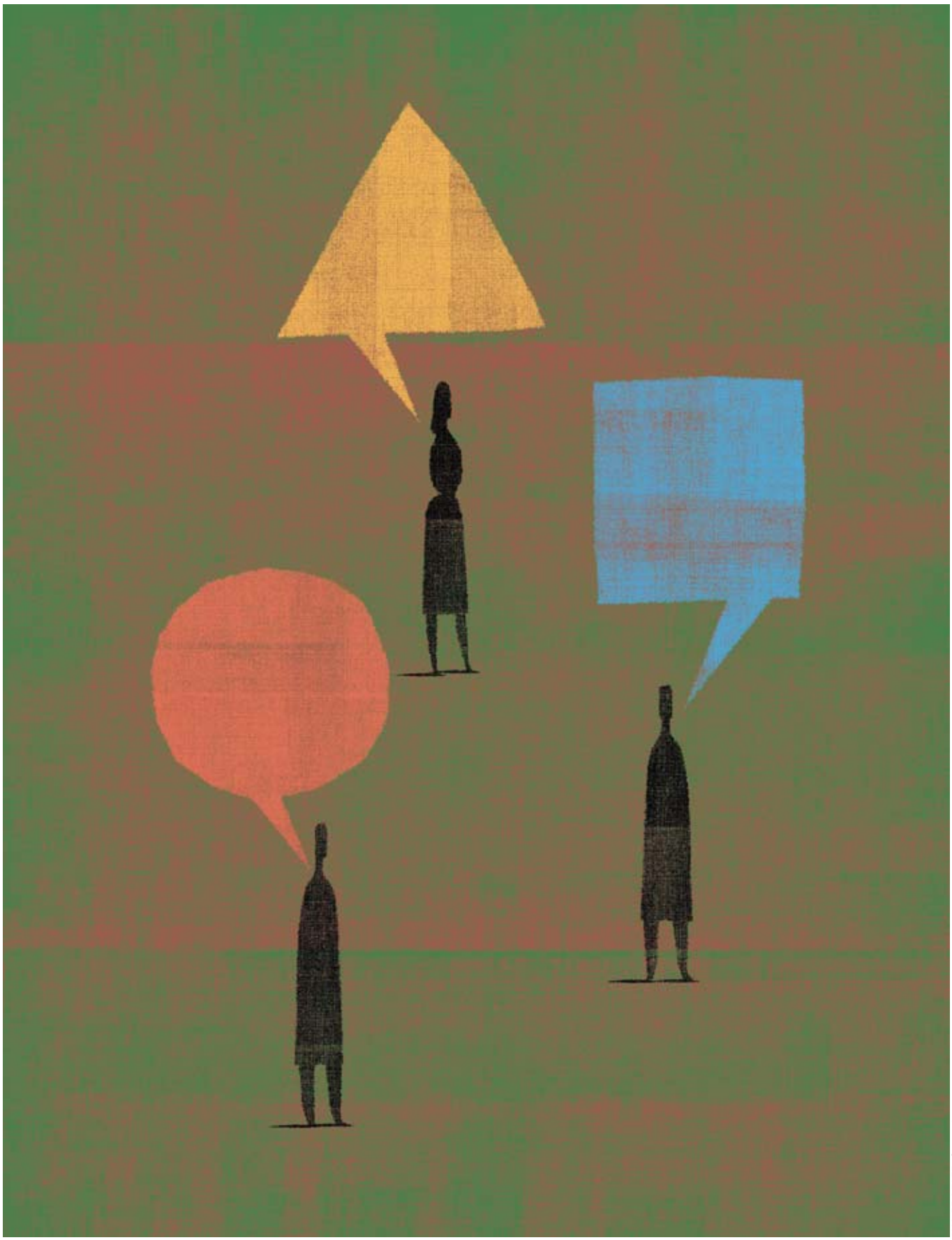

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Researchers are discovering the myriad ways in which language can have a profound effect on the choices we make—from the foods we eat to the laws we support

WHEN WORDS DECIDE

By Barry Schwartz

Imagine that the U.S. is preparing for an outbreak of an unusual Asian disease that is expected to kill 600 people. Government officials have proposed two alternative programs to combat the disease. Under program A, 200 people will be saved. Under B, there is a one-third probability that 600 people will be saved and a two-thirds probability that nobody will. Confronted by this choice, 72 percent of people choose A, preferring to save 200 people for certain rather than risking saving no one.

Now imagine that officials present these two options instead: under program C, 400 people will die; under program D, there is a one-third probability that nobody will die and a two-thirds probability that all 600 people will perish. Faced with this pair of scenarios, 78 percent of people choose D, according to results of a classic study by Nobel laureate Daniel Kahneman, a psychologist at Princeton University, and his longtime collaborator, psychologist Amos Tversky.

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Of course, these two pairs of options—A or B and C or D—are identical: saving 200 lives means that 400 people will die, and in both B and D, taking a one-third chance to save everyone means taking a two-thirds chance to lose everyone. Whichever choice you make, logic would seem to dictate that it should be the same no matter how the options are worded. So why do people tend to prefer A to B but the reverse when the options are described as in C and D?

Kahneman and Tversky's research provides a clue: people respond to choices involving losses, such as deaths, differently from those relating to gains, such as survivors. When choosing between positive outcomes, people tend to be risk averse and want the sure thing (saving 200 people) but are far more willing to take risks when weighing losses—a psychological tendency that can be exploited by the deliberate wording of options. Some 30 years ago Kahneman and Tversky's initial findings in this field launched a concerted inquiry into how the framing of options affects people's decisions. Since then, they and many others have discovered various ways in which language can have a profound—and often counterintuitive—effect on the choices people make.

In addition to the loss-versus-gain effect, recent research shows, for example, that people can be moved en masse to opt for one alternative when it is positioned as the default—an unstated option that people get if they do not make a selection. But pick a different default and a crowd moves the other way, as if magnetically motivated to follow the unmarked road. People's decisions can be subtly influenced by context as well. Pitting one selection against a costlier or more frivolous alternative can make that choice seem more attractive than if it had been matched against a more favorable option.

We all seem rather fickle. Indeed, studies on the psychology of choice somewhat radically imply that we do not strictly possess preferences and values; instead we construct them in response to the questions the world asks us or the choices it presents us. The apparent capriciousness of our opinions often appears irrational, but in some cases there is a funny logic to it: descriptions may influence not only what we choose but also how we enjoy or appreciate that choice—a circular way of making that option the "right" one for us [*see box on page 42*].

Understanding how words steer our decisions regarding gains and losses can help guide the phrasing of public service announcements to best motivate people to, say, conserve energy or take care of their health. In other situations, officials might employ the power of defaults to lead people toward options they are likely to prefer, even if they tend not to choose them out of laziness, hurriedness or misunderstanding. And finally, an awareness of contextual wording traps may enable all of us to reconsider our reactions toward surveys, political campaigns and clever advertisements, recognizing that almost every ques-

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FAST FACTS

Words to the Wise

1» The phrasing of questions or choices can have a profound, and often counterintuitive, effect on the way people make decisions.

2» Positioning one alternative as the default can move people en masse to opt for that choice. Or pitting one selection against a costlier or more frivolous alternative can make that choice seem more attractive than if it had been matched against a more favorable option. Such linguistic influences can be exploited for public benefit or harm.

3» Research on the effects of language on choice suggests that people do not always strictly possess preferences and values but rather construct them when they are asked a question or given a choice.

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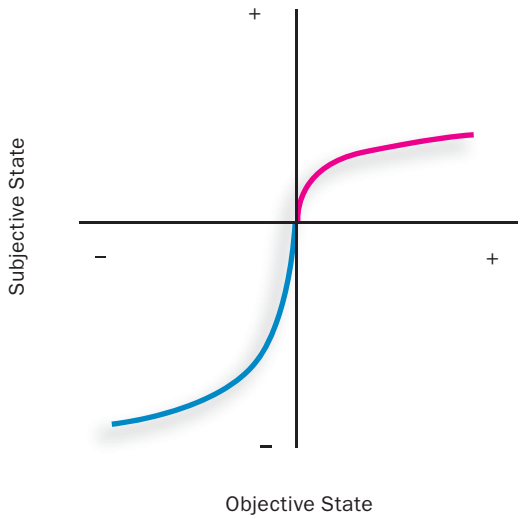
Risky Choices

People respond differently to options describing gains than to those that refer to losses. This tendency, which is explained by something called prospect theory, can result in logically inconsistent decisions. In this depiction of the theory (*graph*), which was co-developed nearly 30 years ago by Nobel laureate Daniel Kahneman, a psychologist at Princeton University, and his longtime collaborator, psychologist Amos Tversky, the *x*-axis plots the objective state of affairs, from negative, for instance, number of lives lost, through neutral (zero) to positive, say, number of lives saved. The *y*-axis plots people's subjective responses to the various objective states—that is, how good or bad these realities make people feel.

The curve in the upper right quadrant captures how people respond to positives, or gains, and its shape portrays the economic principle of diminishing marginal utility. Saving 600 lives will not feel three times as good as saving 200 lives, so people do not want to take a risk to save all 600 people. The lower left quadrant shows how people respond to negatives, or losses, and depicts the diminishing marginal disutility of losses. Because losing 600 lives will not hurt three times as much as losing 200, people feel good about taking the risk to lose nobody. People tend to seek risk more readily when making decisions about losses.

Whether decisions are described by the top right or the bottom left part of the curve depends on how the options are framed. Thus, people are unwilling to take a risk if the phrasing emphasizes positive outcomes, but they may flip to a riskier option if the words express the darker side of a picture. Notice, too, that the loss portion of the curve is about twice as steep as the gain portion, meaning that a loss of, say, $100 hurts worse than a gain of $100 feels good. All in all, people will be more motivated to avoid losses than to secure gains.



tion inexorably biases respondents toward one choice over another.

Gains and Losses

In their landmark research, Kahneman and Tversky pioneered the notion that two ways of describing a choice that are logically equivalent, as in the example above, are not necessarily psychologically equivalent. In something they called "prospect theory," Kahneman and Tversky deciphered the relation between the objective and the subjective as it relates to losses and gains.

Although people do become more satisfied as an outcome gets increasingly favorable, a person's happiness does not increase in linear fashion in relation to the gain, according to prospect theory [*see box above*]. Instead a person's subjective state improves at an increasingly slower rate until an objective improvement in a situation hardly changes a person's satisfaction at all—something economists call "diminishing marginal utility." This means, for example, that saving 600 lives will not feel three times as good as saving 200 lives—so taking a risk to save all 600 people feels like a bad psychological bet. Kahneman and Tversky argued that most people are risk averse when contemplating gains.

When it comes to negative occurrences, such as deaths, changes in a person's emotional state similarly diminish as the situation worsens rather than continuing to worsen at a rate proportional to the circumstances. Thus, losing 600 lives will not hurt three times as much as losing 200 would, so taking the risk to lose no one feels like a good psychological bet. This principle causes people to seek risk when it comes to losses.

And whether people are attending to gains or losses depends on how the options are framed. In the A-versus-B choice people are considering gains, whereas they are pondering losses when faced with the C-versus-D scenario, explaining why people are not willing to take a risk in the first situation but are in the second.

Prospect theory also holds that people actu-

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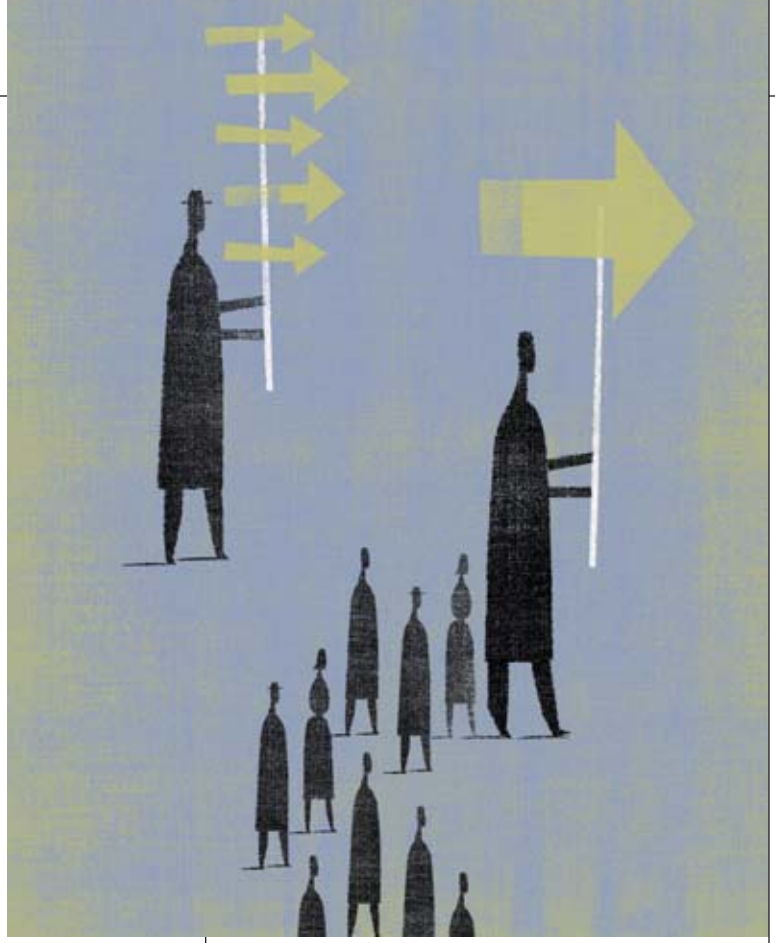

more than 90 percent of the people in many European countries are organ donors, whereas only about 25 percent of Americans are—despite the fact that most Americans approve of organ donation. Why? In the U.S., to be an organ donor you have to sign a form. If you do not sign the form, you are not an organ donor. The latter is the default option, and that is the one most people choose. In much of Europe, the default option is the opposite of the U.S. default—you are an organ donor unless you indicate you do not want to be, so most Europeans make the reverse choice [*see box on opposite page*].

When employers switch procedures for voluntary 401(k) participation from opt-in (you have to sign a form to contribute to the plan) to opt-out (you have to sign a form to decline participation) initial enrollments jump from 49 to 86 percent, according to a 2001 study by University of Pennsylvania economist Brigitte Madrian and Dennis Shea of the United Health Group. And in a real-world experiment, the states of New Jersey and Pennsylvania simultaneously started to offer lower-cost, no-fault auto insurance. These policies restrict the right to sue while requiring insurance companies to pay regardless of who is at fault in an accident. In New Jersey—but not in Pennsylvania—no-fault insurance was the default. As Columbia's Johnson and his colleagues reported in the *Journal of Risk and Uncertainty* in 1993, almost 80 percent of car owners in each state ended up with the default. The choice of default has cost Pennsylvanians millions of dollars over the years.

Wording public service pleas to focus on losses can motivate people to save energy or monitor their health.

ally feel worse about a loss of a given amount than they would feel good about a gain of a similar magnitude. That means getting people to focus on avoiding losses when they make decisions will be more motivational than getting them to focus on securing gains. This fact can be exploited. Appeals to women to do breast self-exams that emphasize the benefits of early cancer detection (gains) are less effective than those that emphasize the costs of late detection (losses). Pleas to homeowners to conserve energy that focus on savings (gains) in utility bills are less powerful than efforts that focus on the added costs of using energy profligately (losses).

The Power of Silence

Another powerful way to influence choice is to leave something unsaid. In the U.S. and many European countries, people who renew their driver's license are asked if they want to be an organ donor. As decision scientists Eric J. Johnson of Columbia University and Daniel Goldstein, now at London Business School, reported in 2003,

Why do defaults have such power? Some of it may come from inattention. Life is busy and complicated, and it is not possible to pay attention to everything. That is why most of us keep our cell phone plan whether or not it is the best one for us. Researching alternatives is time-consuming, and we do not want to be bothered. But laziness and inattention are not the sole reasons for the power of defaults. As University of California, San Diego, psychologist Craig R. M. McKenzie and his colleagues showed in a 2006 study, most people infer that the default is the recommended option.

Given the power of defaults, policymakers

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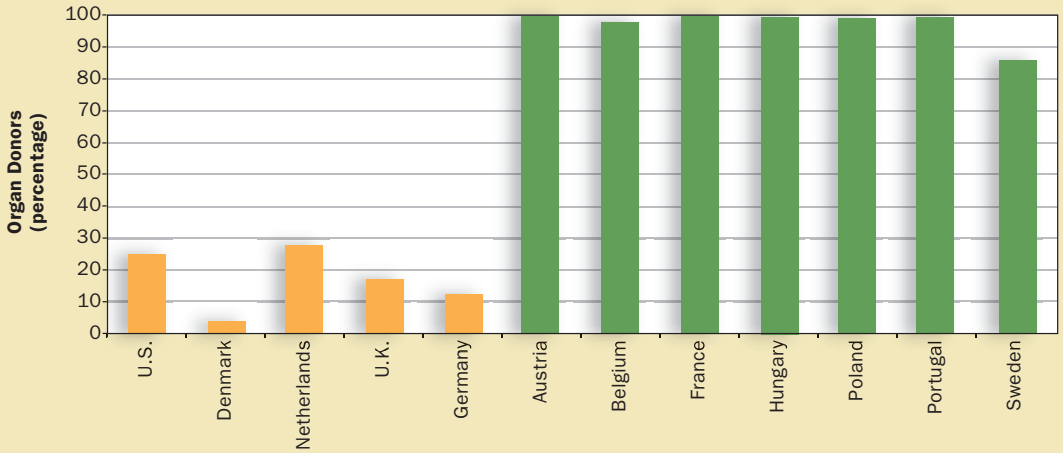
To Be—or Not to Be—an Organ Donor

Many more people effectively agree to be organ donors in countries that have opt-out policies (*green*), in which being an organ donor is the default, than in countries such as the U.S. that have opt-in policies (*gold*), in which people are not organ donors unless they take action.



could use them to nudge people in a direction that will enhance their well-being, something University of Chicago legal scholar Cass R. Sunstein and economist Richard Thaler call "libertarian paternalism." In this practice, leaders would choose defaults with an eye on people's stated or implied preferences (the "paternalistic" part) while allowing anyone to opt out (the "libertarian" element).

Although you cannot always know what people's preferences are, you can often discern them. In the example of 401(k) plans, we can surmise a desire to participate because we know that people are more likely to sign up the longer they stay in their job, as if they have been meaning to do it but have been putting it off. Knowing whether Pennsylvanians or New Jersey residents are getting what they really want for car insurance is harder to determine. But given that it is nearly impossible to present options in a neutral fashion, why not prod people in a direction that makes most of them better off?

Matchmaker

Yet a third major influence of framing on choice is context. The attractiveness of an option will frequently depend on what it is compared with. Some years ago the gourmet food and kitchen gadget purveyor Williams-Sonoma introduced a new product: an automatic bread maker. You just throw the ingredients in, push a button, and several hours later you have a loaf of bread. The device sold for $275. Was $275 a lot to spend on a bread maker? That price was hard to judge because no similar products were then on the market. Months later Williams-Sonoma introduced a "deluxe" bread maker that sold for $429. Sales of the regular bread maker shot up—because the new, more expensive bread maker made the regular one look like a good deal.

Effects like this are pervasive. In research reported in 2002, University of Oregon psychologist Paul Slovic asked a group of people how much they would pay in taxes for an airport safety measure that would save 98 percent of 150 people at risk a year. Then he asked a second group how much they would pay to save 150 people a year. The first group would pay more for the measure than the second group would. Why? After all, saving 100 percent of 150 people is more beneficial than saving 98 percent of 150 people. But when the number 150 has no context, people will consider a broad variety of ways to spend money, many of them affecting thousands or millions of people. On the other hand, giving the 98 percent success rate restricts the context of the question and seems impressive, so people see intervention as quite cost-effective.

(The Author)

BARRY SCHWARTZ is a professor of psychology at Swarthmore College, where he has taught since 1971. He is author of *The Paradox of Choice: Why More Is Less* (Ecco, 2004).

SOURCE: "DO DEFAULTS SAVE LIVES?" BY E. J. JOHNSON AND D. GOLDSTEIN, IN *SCIENCE*, VOL. 302; NOVEMBER 21, 2003

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Taste Tests

The language of choice not only affects what we choose but also—eerily—our sensory experiences of that choice. For example, people will choose a hamburger that is 75 percent lean over one that is 25 percent fat. But then, when they actually taste the two hamburgers (which are, of course, two versions of the same hamburger), the 75 percent lean burger actually tastes better. So although it may seem irrational to prefer one hamburger over another physically identical one, if the burger that is called "75 percent lean" tastes better than the one dubbed "25 percent fat," perhaps it makes sense to prefer that one, after all.

Other examples of food labels influencing our taste buds abound. Perrier is preferred to plain seltzer if both beverages are consumed with their labels showing, but otherwise tasters have no preference. Consumers judge protein nutrition bars that contain "soy protein" as grainier and less flavorful than when the word "soy" is removed from the description. They eat more vanilla ice cream if it is labeled "high fat" than if it is falsely labeled "low fat," which is, oddly, the opposite preference than the one they express for burgers, for which fat may signify "greasy."

And people prefer beer adulterated with balsamic vinegar labeled "MIT brew" to plain beer if they do not know about the adulteration or if they find out about the strange recipe after they have tasted the beers. The preference flips only if people know the beer has vinegar in it before they taste it, according to a 2006 study by Columbia University Business School professor Leonard Lee and Massachusetts Institute of Technology researchers Shane Frederick and Dan Ariely. Thus, what you know or think you know about a food will affect how it tastes, and getting new information after the fact does not cause you to revise your memory of the taste. Labels and descriptions affect not only decisions but also how people experience the results of those decisions.

Consumers prefer Perrier to plain seltzer only if they see the Perrier label.

Are such preferences irrational? The point of choosing a burger, an ice cream or a beer, after all, is to enjoy it. And if you will enjoy "lean" burgers more than "fatty" ones, there is nothing wrong with having choices be affected by descriptions.

Your feelings about a decision are far less significant in other situations, of course. When a choice is about containing a disease, for example, how you feel should be irrelevant; what matters is what happens to the sick people. When choosing between public policies, your feelings about the policies are less important than the effects they will have. But the whole point of deciding what to eat—especially when the two items are nutritionally identical—is how you will feel about eating it. —*B.S.*

In another example of this phenomenon, Kahneman, Sunstein and their colleagues questioned a group of people about how much they would be willing to donate to a fund to reverse or prevent ecological disasters such as the loss of coral reefs and the endangerment of dolphins. Another group was asked how much they would be willing to pay to a program preventing skin cancer among farm workers. Surprisingly, the researchers found that people were willing to pay the same amount to save dolphins as to prevent skin cancer! But when they pitted dolphins and skin cancer directly against each other for a third group, the respondents were willing to spend vastly more money on skin cancer than on dolphins.

What is going on here? When people weigh saving dolphins against other ecological problems, dolphins rate high (they are so cute and so smart), so people will spend lots of money to save them. In contrast, skin cancer ranks low in priority on a list of serious health problems, so people choose to allocate relatively little money for it. But when dolphins and skin cancer appear on the same mental screen, people see skin cancer as

PIERRE VAUTHEY *Corbis/Sygma*

A "death tax" is far less popular than an "inheritance tax," even though these terms refer to the same tax.

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much more worthy of resources. This change in public opinion occurs because when the options are framed narrowly, people decide within that limited context, comparing dolphin conservation only with other ecological issues and skin cancer only to other health issues. They lack a broad mental framework that could be used to contrast and evaluate divergent types of policies.

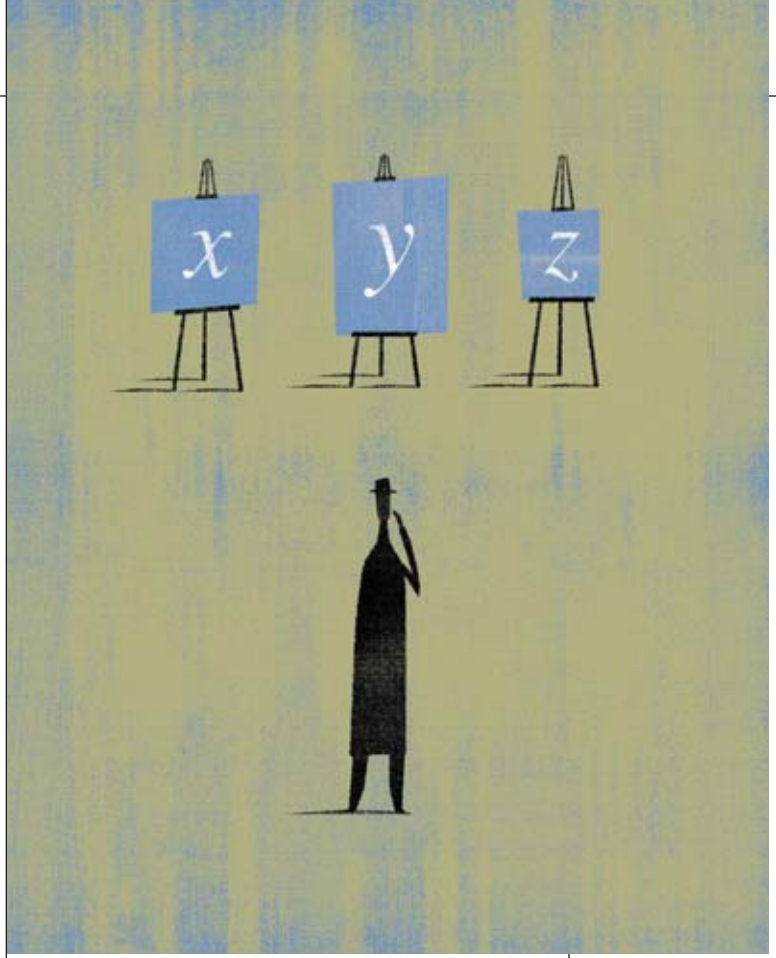
Thus, a more narrowly constructed question can raise a lower-priority project to greater prominence in people's minds, whereas if a public policy choice provides a more expansive framework, individuals can be subtly coaxed to reprioritize. Controlling the frame in a public policy debate can therefore sway the tide of public opinion in whatever direction the framers might prefer.

True Lies

All of this raises a key question: Do people actually know what they want? When faced with a decision, we imagine ourselves rationally considering our preferences and finding the option that best satisfies them. But research on how language affects decisions suggests otherwise. Instead of possessing preferences and values, we may simply create them when we are asked to make a decision. And, as we have seen, values and preferences can bend under the force of the question's wording. Thus, it is extremely difficult to discern people's "true" values and preferences, if they even exist.

Think about the public attitude toward the estate tax—a hefty tax on the assets of wealthy people when they die. This is a tax paid by a tiny handful of people—the most affluent group in the U.S. Yet a majority of Americans oppose it and support President George W. Bush's efforts to abolish it. What explains this peculiar public attitude? Is it that every American expects to be rich one day? I don't think so.

When Bush and his allies in Washington launched their campaign against the estate tax, they relabeled it the "death tax." Think of what this label does. Who pays the death tax? The dead person does. As if dying were not bad enough, the government reaches into the grave to extract its pound of silver. Worse yet, the dead person has already paid taxes on that money, when it was originally earned. Now suppose that instead of calling it a "death tax," we called it an "inheritance tax." Who pays the inheritance tax? The living do—and, unlike the dead, they have never paid taxes on these assets before. The same tax seems much more attractive and fair under that label.



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So what do people *really* think about this tax? Such a seemingly straightforward question is actually exceedingly difficult to answer. When evaluating almost anything, we are at the mercy of its framing or context. We may search in vain for a neutral way to describe policies and products alike, and our failures will have significant effects on decisions of all types. If we are vigilant about monitoring how options are packaged, we might sometimes be able to diagnose framing effects and counteract them. But we will never catch them all. M

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Where Mind AND Body Meet

Conscious physical sensation and conscious emotional awareness come together in the right frontal insula

By Sandra Blakeslee and Matthew Blakeslee

Do you consider yourself to be emotionally intelligent? Are you empathic, able to read other people's feelings even when they try to hide or swallow them? Or do friends rib you about your social cluelessness? Do people see you as spiritually grounded, emotionally balanced, a rock? Or do they say you're repressed, tactless, juvenile? If you weren't in good touch with your own emotional inner world, how would you ever know?

Several years ago nine women and eight men came to Hugo Critchley's laboratory at the Institute for Cognitive Neuroscience at University College London to explore their level of emotional sensitivity. Critchley, an expert on brain mapping who is now at the University of Sussex in England, was interested in the relation between emotional intelligence and a brain function called interoception—your ability to read and interpret sensations arising from within your own body.

Excerpted from *The Body Has a Mind of Its Own: How Body Maps in Your Brain Help You Do (Almost) Everything Better,* by Sandra Blakeslee and Matthew Blakeslee. Copyright © 2007 by Sandra Blakeslee and Matthew Blakeslee. Published by arrangement with Random House, an imprint of Random House Publishing Group, a division of Random House, Inc.

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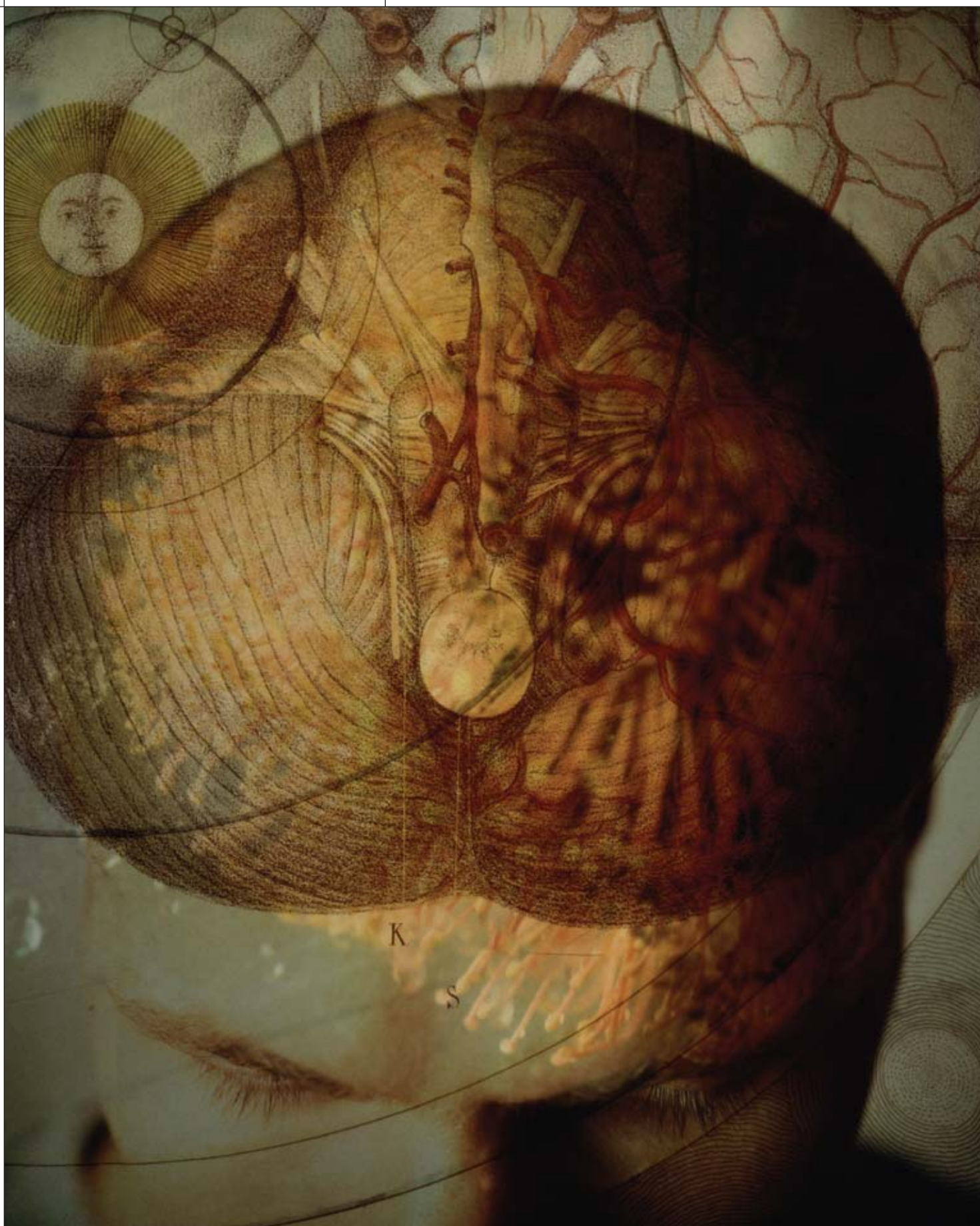

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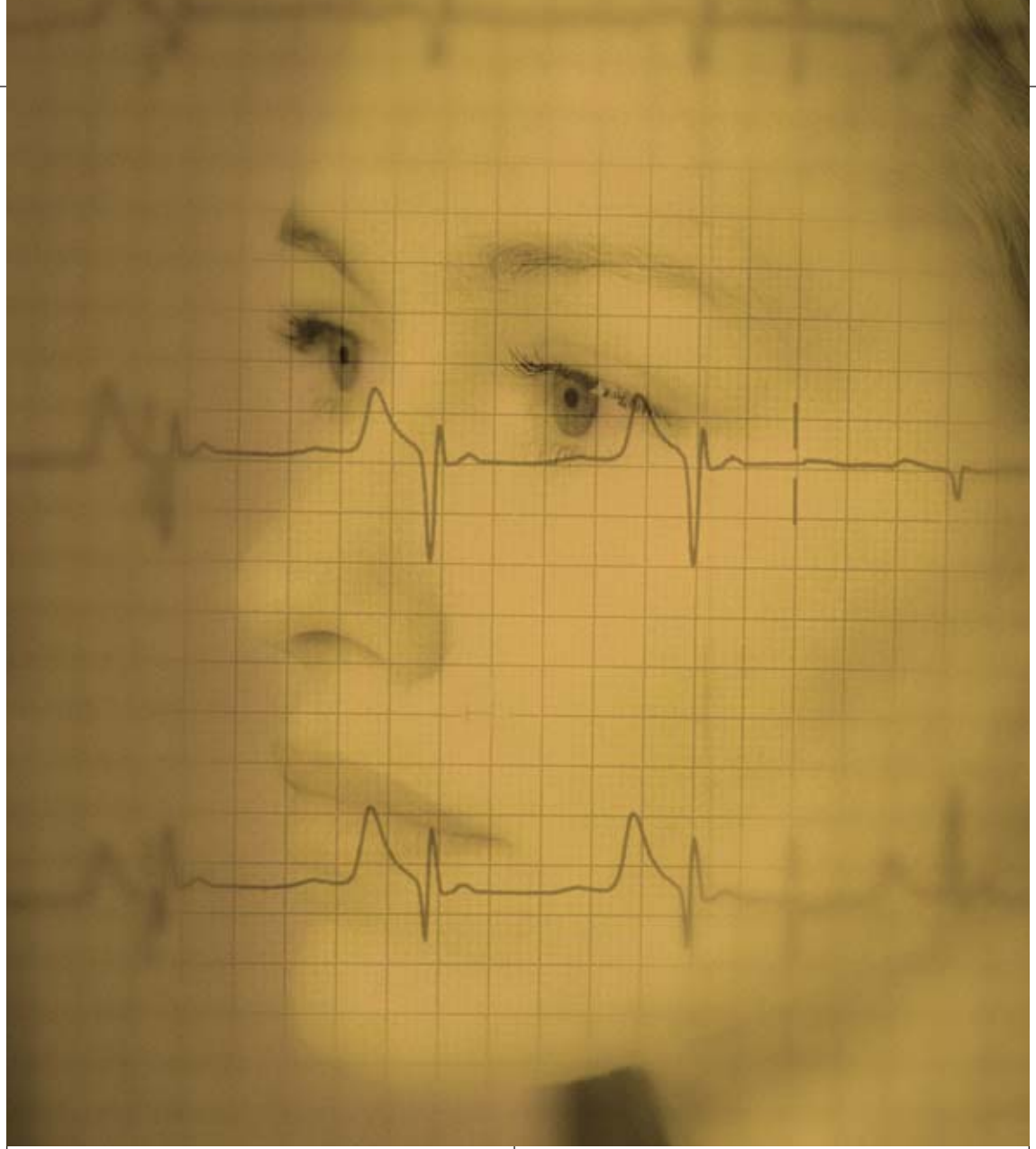

People who are more aware of their heartbeats are also more emotionally astute, studies show—and processing for both types of cognition occurs in the same regions of the brain.

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FAST FACTS

Mind-Body Nexus

1» Research finds that the insula and anterior cingulate cortex are crucial centers of emotional cognition. These brain regions are also necessary for attending to feelings that arise from your body and for experiencing pain.

2» Studies involving the right frontal insula, in particular, show that the more viscerally aware you are, the more emotionally attuned you are.

3» This phenomenon of interoception—your ability to read and interpret sensations arising from within your own body—is essential to fundamental features of being human: sentiment, sentience and emotional awareness.

Pretend you are a participant in such an experiment. You lie down in a brain scanner, put on headphones and place your left middle finger on a pad that monitors your heart rate. Your right hand rests on another pad with two buttons. As the scanner monitors your brain activity, you listen through the headphones to several series of 10 beeps. After each 10-beep sequence there is a pause, and you are asked to make a choice: press one button if you think the beeps were in time with your own heartbeats or press the other button if you think the beeps were slightly out of sync with your heart. Critchley repeats these sequences, sometimes in sync, sometimes not. Can you tell the difference?

Four of Critchley's subjects were supremely confident about when the pulse was synchronous or asynchronous with their heart. They could feel

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the difference, accurately, every time. Two subjects were veritably heart-blind. They never had a clue about whether the pulses were in or out of sync and could only guess at random. The others fell in between.

The brain scans revealed significant activity in several brain regions, notably the insula and anterior cingulate cortex. Both these regions are crucial centers of emotional cognition, and as this study makes clear, they are also necessary for attending to feelings that arise from your body.

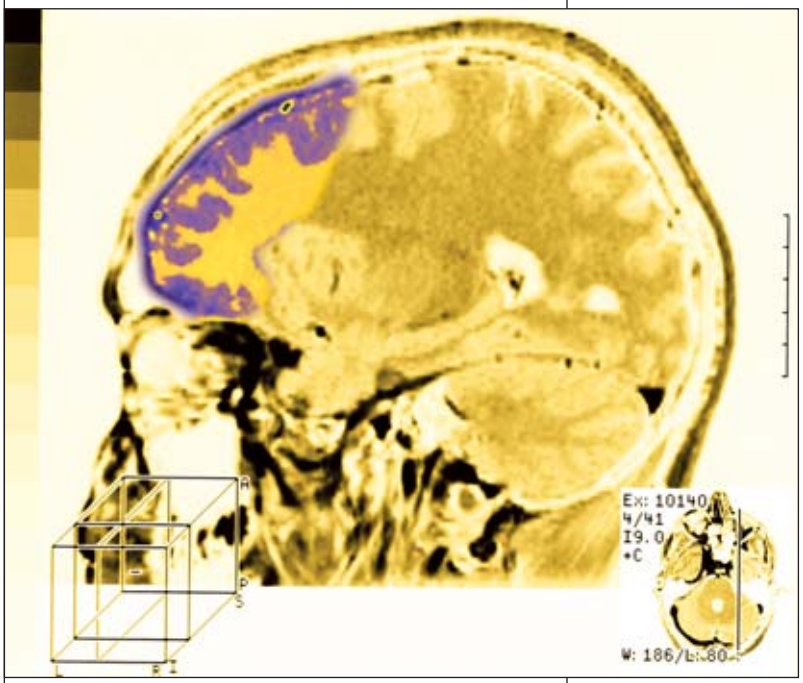
But the most significant finding in Critchley's study involved just one brain region, the right frontal insula. This area showed the greatest activity in those who were best at following their heartbeats. Moreover, these were the people who scored highest on a standardized questionnaire to probe their empathy levels. So the better you are at tracking your own heartbeats, Critchley says, the better you are at experiencing the full gamut of human emotions and feelings. The more viscerally aware, the more emotionally attuned you are.

In a follow-up study, Critchley found that people with greater empathy have more gray matter in their right frontal insula. That is, the thicker this part of your insula, the better you are at reading feelings in yourself and in others. The fact that some people are more emotionally aware than others has a neural, physical basis.

Internal Maps

These experiments are a window into some of your most important and fascinating body maps—those that deal in interoception and emotion. (Just as a road atlas is full of maps that represent real-world locations, your brain is full of body maps that represent aspects of your self, inside and out.) In contrast, the main goal of exteroception, externally oriented perception, is to create maps and models of your body, the world around your body, and your body's relation to the world. Your brain creates and maintains maps of your skin surface, limb position, joint movement and musculoskeletal system so that you can move about and interact with objects and people. You have distinct fibers in your spinal cord that carry such information in both directions: up from your body to your sensory maps and back down from your motor maps to your muscles.

Interoception is a separate realm of somatic sensation that is oriented inward. It has two sources. The first is the internally mapped state of your body. Bring your attention to the sensations these maps are generating in you right at this moment. Think about your heart, lungs, stomach, intestines, rectum, larynx, throat. Try to feel their activity if you can. All your innards have receptors that send information up to your brain for mapping your "gut" feelings of hunger, thirst, air hunger and other visceral sensations.



Emotional activity in the brain appears in the frontal lobe in this colored magnetic resonance image (MRI).

The second source of your interoceptive maps consists of a different class of receptors found on your body's surface, including your teeth, gums and tongue. Unlike the touch receptors that deal in pressure and vibration and are tied mainly to deliberate touch and action, these other receptors carry information about the "homeostatic" condition of your body—temperature, pain, itch, muscle ache, sexual arousal, crude touch and sensual touch. Homeostasis refers to your body's ability to maintain internal balance. Your spinal cord contains an evolutionarily older set of fibers that carries this information to and from your brain.

This may seem strange at first, because many of your body parts end up being mapped by both systems. If someone pinches your arm, the pressure and pain will be represented in your primary touch map. But the pain will be rerepresented in your insula. Why is pain from one pinch mapped in two places? Because your insular maps serve a different function from your primary touch and motor maps. They are the command center for homeostatic self-regulation. For example, to run your body's thermostat properly—to keep your body temperature constant—your brain needs to know not just about your

JAMES CAVALLINI *Photo Researchers, Inc.*

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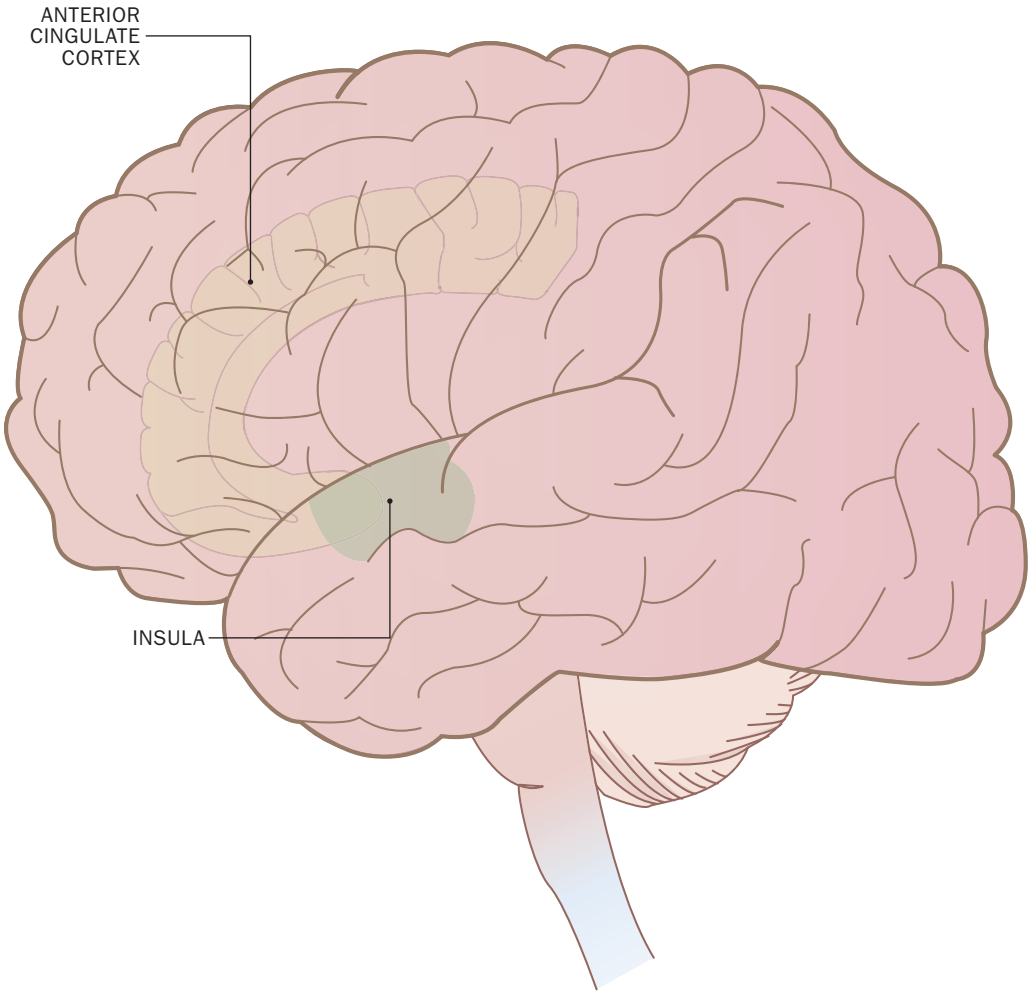

The insula and anterior cingulate cortex are involved in attending to feelings that arise from your body.

core temperature but also about air touching your skin. Pain in your muscles, lungs and joints is important for marshaling your body's resources during exertion, but so are sensations of strain and movement and resistance in your joints and skin. So the primary brain maps for homeostatic signals from your body surface—about itch, sharp pain, dull pain, burning pain, tickle, sensual touch, heat and cold—as well as the sensations arising from your body's interior, are mapped in your insula, not in your primary touch cortex. You use these feelings less to deal with the outside world than to seek balance within your body and put your internal sensations in context.

And as Critchley's results imply, interoception does far more for you than just letting you know you are hungry or exhausted or sexually sated. It is also a crucial ingredient in some of the most important aspects of human beingness: sentiment, sentience and emotional awareness.

The Sting of a Bee and of a Rebuke

Your interoceptive maps are a souped-up version of neural circuitry that had already become highly advanced in the primate line. In lower vertebrates—a frog, say—sensory information is integrated in the primitive base of the brain. These animals do not have a cortex, the mantle of higher thought and awareness. So a frog's vision, for example, is extremely primitive and robotic in function. It is keyed to buglike motions made by small, dark, dotlike objects. When the frog "sees" such a stimulus, a targeted tongue attack reflex is triggered. This is just about the only way the frog has to visually identify its food. When a

LUCY READING-IKKANDA

(The Authors)

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frog is placed in a terrarium and surrounded by dead insects suspended on strings, it will starve to death. Its cortex-free vision just does not have the power to recognize individual features of its prey, such as legs or wings.

The greatest evolutionary innovation of mammals was the expansion of the cortex to tremendous size. The cortex imbues the mammalian mind with the capacity to form highly detailed and versatile representations of sights, sounds and actions. So a rat, for example, has a rich understanding of the space around its head, thanks to its sensitive whiskers and well-developed body and whisker maps. And even though rats do not have particularly good vision, they can still tell an insect from a wad of used dental floss at a glance because they have cortical vision maps.

But in the rat—and, for that matter, in all other mammals aside from primates—the homeostatic information from the body does not form a rich interoceptive map in the insula. Rats do have insular maps, to be sure, but they are rudimentary. In a rat, pain, itch, sensual touch and that whole ancient group of somatic senses are primarily integrated in the base of the brain and in subcortical emotional centers. Their interoception, then, is more reminiscent of the frog's automatonlike vision than of the primate's keen, knowing eye.

The same goes for cats, dogs, horses and other four-legged animals. Because of this difference in mapping, some experts claim that their sensory experiences must be profoundly different from ours, even though we are often tempted to attribute human emotions and intentions to our pets. Whereas a dog may show "shame" through its body language, it does not feel what you feel when you are ashamed. Dogs are clearly emotional and self-aware, but they are not in the same league as you.

In primates, interoceptive information is elaborated through a rich set of mappings in the insular cortex. And in humans, it is richer still. Thus, you have a little insular map for sharp pain, another for burning pain, one for itching, one for aching, one for overexerted muscles, and so on,

> The greatest evolutionary innovation of mammals was the expansion of the cortex to tremendous size.

DALY & NEWTON *Getty Images*

Lacking a cortex, the mantle of higher thought and awareness in mammals, the frog cannot see the bug until it moves.

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The dog's body language says "shame," but its emotional experience is not the same as that of a person who feels humiliated.

CORBIS

along with visceral homunculi (body maps) that represent the state of your lungs, heart and the rest of your innards.

And even that is just the beginning of what your brain does with this information. After reading off the internal state of the body from both the left and right insulas, the human brain—and only the human brain—performs yet another level of integration. The information from both your insulas is routed to the right frontal insula, the same region Critchley found to correspond closely in size and metabolic vigor to a person's empathic talent.

Your right frontal insula "lights up" when you feel all the quintessential human emotions—love, hate, lust, disgust, gratitude, resentment, self-confidence, embarrassment, trust, distrust, empathy, contempt, approval, disdain, pride, humiliation, truthfulness, deceit, atonement, guilt. It also lights up when you feel strong sensations, from physical pain to a fluttery stomach to tingling loins.

If your right frontal insula is damaged by a stroke, you will not be able to detect or feel disgust. If you look at someone who takes a bite of food, spits it out, and makes a retching sound with a disgusted look on his face, you will just smile, take a bite of the same food, and declare it delicious.

This dual physical-emotional sensitivity is not just a coincidence. The right frontal insula is where conscious physical sensation and conscious emotional awareness co-emerge. Consider this amazing fact: the right frontal insula is active both when you experience literal physical pain and when you experience the psychic "pain" of rejection or the social exclusion of being shunned. It lights up when you feel someone is treating you unfairly. Scanning experiments have proved all this, and the results are profound.

Reason Runs Hot

Arthur "Bud" Craig is a neuroanatomist at the Barrow Neurological Institute in Phoenix and the first person to figure out how interoception is uniquely wired in the human brain. He is the kind of superintense scientist who unapologetically spouts rapid-fire jargon—ventrolateral prefrontal cortex, solitary tract nucleus, posterior ventral medial nucleus. But for those who listen and translate, Craig is telling a story that drastically revises our scientific understanding of how bodily sensations are mapped in the human brain and turned into feelings, motivations, pain and sentience.

The right frontal insula is the focal point of all this activity, according to Craig, because it literally connects the state of your body to the state of your brain. By "your brain," in this context, he means the sensory perceptions, abstract thoughts, linguistic processing and motivations that occur elsewhere throughout your cortex. Your right frontal insula gives rise to the map of "the emotional me" and "the emotional now" by integrating homeostatic information from both your body and your brain. This is a profoundly important insight. You detect the state of your body and the state of your mind together in the right frontal insula. It is here that mind and body unite. It is the foundation for emotional intelligence.

If your mirror neurons are activated by another person's emotional state, your right frontal insula lights up. [For more on mirror neurons, see "A Revealing Reflection," by David Dobbs; Scientific American Mind, April/May 2006.] If you sense fear in a crowd, crave drugs or see someone cheat, your right frontal insula lights up. If you have schizophrenia, your right frontal insula is deformed.

Your right frontal insula integrates your mind

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and body through strong connections with three other brain regions. One is the amygdala, a lower brain area that plays a key role in linking strong emotions to experiences, people and things. Another is the orbitofrontal cortex, a region that is critical for self-discipline and for setting plans and priorities in relation to rewards and punishments. And finally, it is linked to the anterior cingulate cortex, which allows you to monitor your behavior for mistakes, correct and avoid errors, evaluate context, and plan and carry out actions that have emotional and motivational significance. The anterior cingulate also contains a mapping of your body, with your head at one end and your feet at the other, but so far as is known, the orbitofrontal cortex and amygdala do not.

In every brain-imaging study ever done of every human emotion, the right frontal insula and anterior cingulate cortex light up together, Craig says. He takes this to mean that in humans, emotions, feelings, motivations, ideas and intentions are combined to a unique degree, and that this is a key element of our humanity.

Actually, the idea that we sense our emotions from our bodies has been around for more than a century. Two psychologists, William James and Carl Georg Lange, long ago developed a theory that emotion arises when you perceive changes in your body. When you run from a bear in the woods, you are afraid not because of your rational assessment that you are about to be eaten but because your heart is racing, your stomach and sphincter are clenched, and you are running as fast as you can. In the wake of an argument, as long as your heart is still racing you still feel angry. There is an aspect of this that has bearing on many relationships: in women, according to Stanford University neuroscientist Robert Sapolsky, the autonomic nervous system ramps down more slowly than in men. As Sapolsky likes to say to his wife after a spat, "Honey, don't forget the half-life of the autonomic nervous system!"

This theory explains why people with whole-body paralysis often complain that their passions and emotions have become blunted. It is why psychopaths, who often have trouble feeling sensations from their body, feel no guilt, remorse or anxiety about their actions. It is also why taking a beta blocker—a drug that quiets your sympathetic, or "fight or flight," nervous system—can banish the butterflies from your stomach, still your quivering limbs, turn off your drenching stage-fright sweats, and allow you to speak or perform calmly in public. In other words, the fear is more in your body than in your mind. Dampen your interoceptive signals, and you dampen the fear.

In humans, emotions, feelings, motivations, ideas and intentions are combined to a unique degree.

Antonio R. Damasio, a neuroscientist who heads the Brain and Creativity Institute at the University of Southern California, has updated and revised James and Lange's idea with his somatic marker hypothesis—the notion that your feelings strongly contribute to even the most "rational" decision making in everyday life. Scientists used to assume that reason and emotion were qualitatively different psychic spheres. Clearly, these spheres could influence each other, yet most believed that the thinking, knowing, reasoning part of the mind was in some fundamental way distinct from the mind's feeling, sensing, emotional and more primitive aspects. But James and Lange, and now Damasio, Craig and others who follow the neuroscience, argue that it is just not possible to separate them at a deep level.

Emotion is never truly divorced from decision making, even when it is channeled aside by an effort of will. Even a mathematician pursuing the trail of a new proof is driven by a blend of personal ambition, curiosity and the sometimes spine-tingling Platonic beauty of the math itself. Even a judge who renders a verdict that the law supports but that he finds personally distasteful is being driven by a moral emotion about the principle of the rule of law. Even a terrorist coolly gearing up for a suicide attack is spurred by an intensely felt motivation inspired by his love of God and God's favored people, who also happen to be his own.

Interoception, then, is the font of your complex emotionality. It breathes life into your cortex, which is otherwise rather machinelike in character. Interoception is the fire under the kettle of consciousness; remove the heat, and the system settles into tepid equilibrium. M

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DEADLY DREAMS

AFTER A RECENT SPATE OF SCHOOL SHOOTINGS, RESEARCHERS ARE ANALYZING THE MALIGNANT FANTASIES OF YOUNG ASSASSINS FOR WARNING SIGNS THAT COULD HELP PREVENT FUTURE TRAGEDIES

BY FRANK J. ROBERTZ

On August 30, 2006, a 19-year-old youth, clad in a trench coat, drove into the parking lot of his former high school in Hillsborough, N.C.—and began firing. Eight random shots wounded two students. When the police arrived, Alvaro Castillo gave up without a struggle. It was Castillo's second exploit involving firearms that day. Earlier Castillo had murdered his father in the family home.

Three months later in the small town of Emsdetten, Germany, 18-year-old Sebastian Bosse posted a video message on the Internet: "I can't f–kin' wait until I can shoot every mother-f–kin' last one of you." He then drove to his former school, armed with out-of-date rifles and homemade pipe bombs. Marching through the building, he shot randomly at students and teachers, injuring 37 people before ending his own life.

DANIEL MACKIE *Getty Images*

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In a candlelight vigil, Virginia Tech students pay tribute to those who lost their lives in this past April's campus massacre.

MANNIE GARCIA AFP/Getty Images

And the deadliest school rampage so far occurred on April 16, when a 23-year-old college student named Seung-Hui Cho killed 32 people and wounded 25 others on the Virginia Tech campus in Blacksburg. After police arrived, Cho put a gun to his temple and pulled the trigger.

The overall number of homicides committed at U.S. schools has declined since the 1990s—a trend that jibes with the declining rate of homicides carried out by juveniles across the globe. Yet some of these killings now display a new quality: they are premeditated and choreographed, down to the weapons used and the clothes worn. My colleagues and I have detected a sharp jump over the past decade in the number of such school shootings worldwide—excluding gang-related incidents—that were intended to kill at least two people or a school official. In the U.S., the rate of such extreme killings has declined only slightly in the past four years from an uptick in the late 1990s. Incidentally, the vast majority of the perpetrators are male; by our count, females instigated only four of the 101 school shootings that have occurred worldwide since 1974.

The chances of dying at school remain exceedingly small [*see box on opposite page*], but the most recent spate of school shootings has cast a dark shadow over a place intended to be a safe, enriching environment for children. This terrifying trend has brought a new urgency to efforts to unravel the roots of such deviance and to help educators, parents and psychologists recognize signs of trouble before a problem escalates.

About two years ago my colleagues and I cofounded the Institute for Violence Prevention and Applied Criminology in Berlin in part to design guidelines for preventing violence in schools. Since then, our work with violent adolescents and adults has helped us understand some of the motivations of young shooters and identify several warning signals that can help predict school rampages.

Many of our insights have come from analyzing the violent fantasies of adolescent shooters. These imaginings take root in a desperate mind that yearns for recognition. Often these young assassins are inspired by examples set by previous shooters. The fantasies typically intensify over a number of years before they are acted on. With time, the mental images become more detailed, and they often become buttressed by a distorted sense of what is just or moral, such as the need to avenge a perceived offense or the belief in a divine right to decide the fate of others.

Early on, troubled teenagers typically keep these fantasies secret, but they increasingly begin to leak their thoughts and plans to friends, chat rooms and even media outlets. Recognizing the signs of such deadly thoughts, as opposed to harmless daydreaming, can enable parents, teachers, social workers and other trusted adults to head off trouble before it begins. We have recently developed strategies for identifying youths at risk, for helping to prevent them from descending into a destructive fantasy world and for reacting expediently in the event of an imminent or actual shooting [*see box on page 57*].

Seeds of Violence

Fantasies and dreams often stimulate productive human activity. They also drive the healthy psychological development of children and adolescents, making possible prospective, or "wishful," thinking and creativity. So it is normal for an adolescent boy to escape into reveries about lovemaking with his girlfriend during an acutely boring class in school.

FAST FACTS

Violent Intentions

1» There has been a sharp jump over the past decade in the number of school shootings worldwide—excluding gang-related incidents—that were intended to kill at least two people or a school official.

2» Warning signals that can help predict school rampages can be found in the violent fantasies of adolescent shooters; the most ominous fantasies gradually consume ever more psychic space and become buttressed by a distorted sense of what is just.

3» Signs of trouble include disclosure of aggressive intentions, interest in obtaining guns, collecting movies and posters of shooters, and being a social loner.

4» Disillusioned youths need help finding a place for themselves in society by getting involved in activities, finding a job and establishing social ties.

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The risk of dying in school remains very low, but school killings have recently become more vicious.

Of course, dreams and daydreams sometimes have a dark and violent cast to them. Almost everyone has imagined vengeful scenarios, even murderous ones, after particularly frustrating experiences, according to research by psychologist David Buss of the University of Texas at Austin. Such fantasies can defuse tension and thus might be considered a type of psychological hygiene. As Austrian psychoanalyst Theodor Reik put it: "A thought murder a day keeps the psychiatrist away."

But what is cleansing to a healthy mind may overwhelm a less balanced psyche. Signs of psychic trouble include being excessively introverted and lacking strong social attachments. Cho's peers described him as "quiet" and as someone who would not respond when others greeted him. Violent offenders are also often pessimistic about their future and have low self-esteem; many have been harassed, bullied or rejected by classmates; suspended from school; or pressured by teachers. Cho was reportedly teased and picked on in middle school for being shy and for his unusual way of speaking.

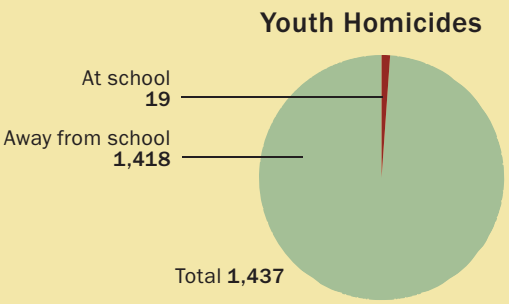
Adolescents who saw or otherwise experienced violence at a young age are very susceptible to intense brutal fantasies, points out clinical psychologist Al Carlisle, who practices in Price, Utah, and has long studied serial killers and young violent criminals. Such experiences, Carlisle says, foster a belief that violence is the only way to gain recognition and respect.

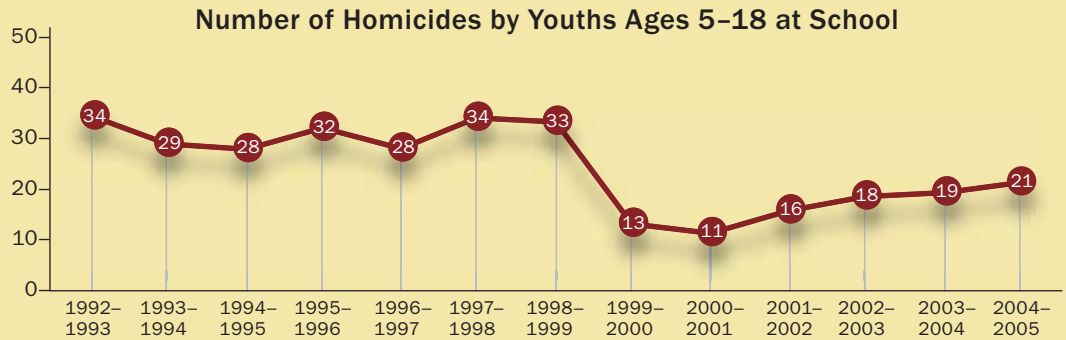
Thus, the media attention showered on previous school shooters such as the Columbine killers Eric Harris and Dylan Klebold often appeals greatly to would-be copycats, because the publicity may pass for esteem in their minds. After their April 1999 rampage, which left 13 dead and 24 injured at Columbine High School in Littleton, Colo., Harris and Klebold were on the covers of magazines and the front pages of newspapers for weeks.

Castillo and Bosse had stated several times that they idolized Harris and Klebold. Cho called

School Killings: Small Piece of the Pie

Despite the media attention surrounding school shootings, homicides by youths at school have declined since the 1990s (*graph*). The vast majority of homicides by youths occur outside of school (*pie chart*).





SOURCE: NATIONAL CENTER FOR EDUCATION STATISTICS, INDICATORS OF SCHOOL CRIME AND SAFETY, 2006

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Once inspired, a disturbed youth may tumble into an increasingly violent fantasy world.

them martyrs. On Internet fan pages Harris is compared to a god, and at a recent auction Klebold's old car fetched a price way over book value, almost as if it were a religious relic.

Evolving Apparitions

Once inspired, a disturbed adolescent may slowly tumble into an increasingly elaborate fantasy world. FBI interviews with imprisoned multiple murderers have shown that the most ominous violent fantasies gradually consume ever more psychic space. In the beginning, they may be a harmless way to pass idle hours, but later they mutate into an obsession. Eventually a dangerously violent vision dominates a youth's thoughts and cries out for action.

An unbalanced adolescent often embellishes his daydreams with details of the venue and manner of the imagined massacre—in some cases, amassing ideas from violent or violence-promoting movies, games and Web sites. Schools are a natural target because adolescents experience the worst slights in school. Two months before his rampage in Germany, Bosse wrote in his diary, "Imagine that you're standing in your old school and that your trench coat conceals all of your tools of righteousness, and then you throw the first Molotov cocktail, the first bomb. You are sending the most hated place in the world to Hell!"

Causes of Death in Youths

Probability that a youth age 5 to 19 will die every year from:

Any cause	1 in 3,000
Traffic accident	1 in 8,000
Homicide, away from school	1 in 21,000
Suicide, away from school	1 in 28,000
Cancer	1 in 33,000
Accidental drowning	1 in 73,000
Accidental fall	1 in 390,000
AIDS	1 in 420,000
Act of nature, including lightning	1 in 780,000
Homicide at school	1 in 1,700,000

As fantasies become increasingly important to a disturbed youth, he begins to neglect his real relationships to focus on the mechanics of the deed he has dreamed about. Then a serious frustration, such as the breakup of one of his last friendships, may redouble his efforts to sketch out his killing.

Would-be school shooters seem to advance ineluctably toward their idols. Copycats often wear similar clothing and choose the same weapons as those of their heroes. Among other copycat actions, Castillo wore a trench coat just as the Columbine shooters did. He also mimicked their weaponry, going so far as to name his shotgun Arlene, the same name Harris gave his shotgun. (Arlene is a character from the series of novels inspired by the 1993 computer game Doom.) Frequently, those in the final stages of planning a rampage state a desire to do it "better" than their predecessors—which generally means killing even more people.

Distorted Thoughts

Fully embellished pathological fantasies are often rationalized by a distorted sense of what is just, something that sociologist and violence researcher Jack Katz of the University of California, Los Angeles, terms "righteous slaughter." Castillo apparently felt that murdering his father was a way to right past wrongs done to his family. In a videotaped statement, the young man angrily recounts his father slapping his mother, along with him and his sister, on the head, back and rear—hitting at the camera as he speaks to it. It is not clear to what extent the abuse was real, but Castillo seemed to believe it was reason enough to kill.

Even so, Castillo wanted to be known as more than a father killer. Near the end of his final video segment, he announced: "It's time to teach history a lesson." That is where the school shooting came in. Castillo wanted to be remembered as a shooter in the tradition of Harris and Klebold. Just before the teenager was taken away from the school grounds in a police car, he yelled out to the cameras, "Columbine! Remember Columbine! Eric Harris, Dylan Klebold!"

For their part, Harris and Klebold seemed to have had more sinister motivations, with fantasies of malevolent grandeur that Katz categoriz-

SOURCE: UNIVERSITY OF ARKANSAS SCHOOL VIOLENCE RESOURCE CENTER, 1997

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Plan of Attack

Along with helping troubled youth, schools must also shield their students and faculty from young people who may pose a threat. The best protection is a good game plan. School officials should set up an emergency file with local police that describes how to respond to threats within the school.

The instructions would provide guidance on how to handle perceived threats, say, when a student has drawn a picture of himself perpetrating a massacre. They would specify the questions a teacher should ask the student about the drawing and who to call—from psychiatrists to firearms experts—for a professional evaluation of the potential threat, if one exists.

During an attack, the emergency blueprint would state what to tell police over the phone, which school personnel to notify, how to cope with the press and how to avoid becoming a target. For instance, instead of running outside, security experts say it is safer to stay put and shut all doors and windows, closing off access to the room—and to you.

Despite the appearance of protection, monitoring cameras and metal detectors cannot prevent carefully planned school shootings. Shooters have typically entered schools with weapons at the ready; the detectors did not stop them. On the other hand, images from monitoring cameras at Columbine were later found on the hard drives of copycats, serving as inspiration. Robert Steinhauser, a 19-year-old expelled student who shot 16 people in a German school in 2002, saved one of the images under the file name "vista!" Cameras and metal detectors also promote a sense of danger in a place that ought to feel safe.

Schools are, in fact, safe. Though terrifying, homicides of any kind at school are exceedingly rare. Out of roughly 54 million children in grades K through 12 who attend school in the U.S., only 21 students were killed on school grounds in 2005. Thus, that year the chances of being murdered in school were about one in two million. Kids are 50 to 80 times more likely to be killed outside school than inside it. And they stand a far greater chance of dying in a traffic accident than being murdered at all [*see box on opposite page*]. —*F.J.R.*

Metal detectors and scanners do not stop school shooters; they do, however, promote a sense of danger in a place that ought to feel safe.

NAJLAH FEANNY *Corbis*

es as "primordial evil." In their diaries, published in July 2006, they painted themselves as gods who wished to be feared, not loved. One year before the killings, Klebold wrote in his school yearbook, "My wrath … will be godlike." As gods, Klebold and Harris felt they stood above society and were beyond its control—and laws. And to demonstrate their "omnipotence," they became masters of life and death.

Cho may have been trying to defend a similarly overwrought and distorted sense of morality. In his video Cho denounced materialism and hedonism, and in a note police found in his room he condemned "rich kids," perhaps suggesting that his murders were an attempt to get back at privileged people. In another video, he hinted that he would become a martyr akin to Jesus Christ, musings that echo the grander fantasies of Klebold and Harris.

(The Author)

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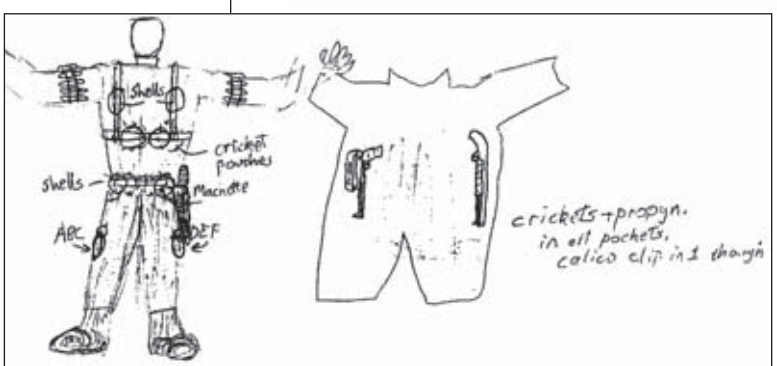
Columbine killers Eric Harris and Dylan Klebold depicted violence, including a drawing that portrays feelings of godlike omnipotence and hatred (*above*) and a sketch of outfits adorned with weapons (*below*).



COURTESY OF JEFFERSON COUNTY SHERIFF

Cries for Help

Although adolescents may at first hide their destructive fantasies out of fear of rejection, over time they may increasingly feel a need to express them. Bosse, for example, created drawings and poems and dropped hints of his plans in conversations. Like some other emotionally disturbed youth, Bosse cried for help. In an online forum two years before his shooting spree he wrote: "I am gorging on my entire rage, and one of these days I'm going to let it out and get revenge on all the assholes who made my life miserable.... For those of you who haven't gotten it yet: yes, I'm going to go on a rampage! I don't know what's the matter with me, I don't know what to do, please help me."

A few hours before his rampage, Bosse e-mailed a scanned copy of his diary to several schoolmates and wrote in a suicide note: "Because I know that the fascist police won't publish my videos, notebooks, or diaries or anything else, I've taken care of that myself."

In some cases, a youth may alert the media to his plans. At Virginia Tech, Cho unleashed two

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Building relationships with socially accepted people is the best way to prevent violence, criminologists say.

shooting sprees separated by two and a half hours. During that intermission, the young killer mailed a package of homemade videos, photographs and writings to NBC News. Castillo sent a video to a local newspaper in which he vented his rage and hinted that he was planning a massacre at his former school.

Such communications should not be ignored. School personnel, parents and peers alike need to be alert for verbal, written and other signs that an adolescent is becoming engulfed in a destructive fantasy world.

We are training teachers, principals and school psychologists to differentiate signs of serious trouble from ordinary adolescent rebellion. In addition to disclosing aggressive intentions, a student who is extremely interested in obtaining guns, collects movies and posters of shooters, regularly visits fan Web sites for school shooters or is a social loner is likely to be in dire need of professional help. Symptoms of depression in a young person are another warning sign. In December 2005 a physician examined Cho and found him mentally ill, noting that he had a flat affect and depressed mood.

Access to weapons is yet a further cause for alarm, indicating that the youth has the means to turn fantasy into reality. Robert Steinhauser, a 19-year-old expelled student who executed 16 people in a school in eastern Germany in 2002, was a gun club marksman who had access to enough ammunition to kill hundreds of people.

On the other hand, teachers should not panic if a student sports a rebellious hairstyle or outfit, and they should exercise judgment if someone is carrying a potentially dangerous object. In the aftermath of the Columbine killings, a student was expelled for coming to school with green hair. Another child who brought a knife to school because her mother thought it would be useful for cutting an apple was expelled *after* the student turned the knife in on her own. Such an overreaction perpetuates fear and hurts the students.

Seeking Respect

For kids in need of help, however, a thoughtful response to the problem is essential. School psychologists and social workers need to help disillusioned youths find a place for themselves in society, something many of them feel they lack. In one of Castillo's home videos he says: "All I wanted was respect.... No one respected me." Earning that respect might take the form of finding a job or an activity that they enjoy and in which they excel. On a broader scale, schools should offer seminars that advise students on ways to discover their talents and interests and how to use them to earn admiration.

Strong relationships with peers, teachers and other adults provide an even more effective shield against destructive fantasies. Criminologists have known for decades that building and maintaining relationships with socially accepted people is the best way to prevent violence. When a youth establishes ties to people he cares about, he is apt to feel that he has too much at stake to act out his brutal dreams.

All adolescents, not just teens at risk, should receive more social training in school. Primary violence prevention classes, for example, teach students social skills (such as empathy) and peaceful options for resolving conflicts. In addition, a teacher's role should extend beyond dispensing knowledge to forging friendships with students and providing young people with adult confidants and role models. At the same time, teachers would be advised to educate students to view critically all media that glorify violence.

The news media must take a stand as well. To make identifying with other school shooters more difficult, journalists and producers should focus less on the perpetrator, his deviant motives and the moment-by-moment unfolding of the deed—and more on the consequences of the crime. M

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Is Greed Good?

Economists are finding that social concerns often trump selfishness in financial decision making, a view that helps to explain why tens of millions of people send money to strangers they find on the Internet By Christoph Uhlhaas

Would you buy a used car online, sight unseen and without a test-drive? How about a plane? A vehicle changes hands on eBay Motors every 60 seconds, including one private business jet that sold for $4.9 million. Every second buyers collectively swap more than $1,839 for products through eBay, sending money to complete strangers with no guarantee that the goods they buy will in fact arrive, let alone in the condition they expect.

As a rule, they are not disappointed. To some economists, this is a borderline miracle, because it contradicts the concept of *Homo economicus* (economic man) as a rational, selfish person who

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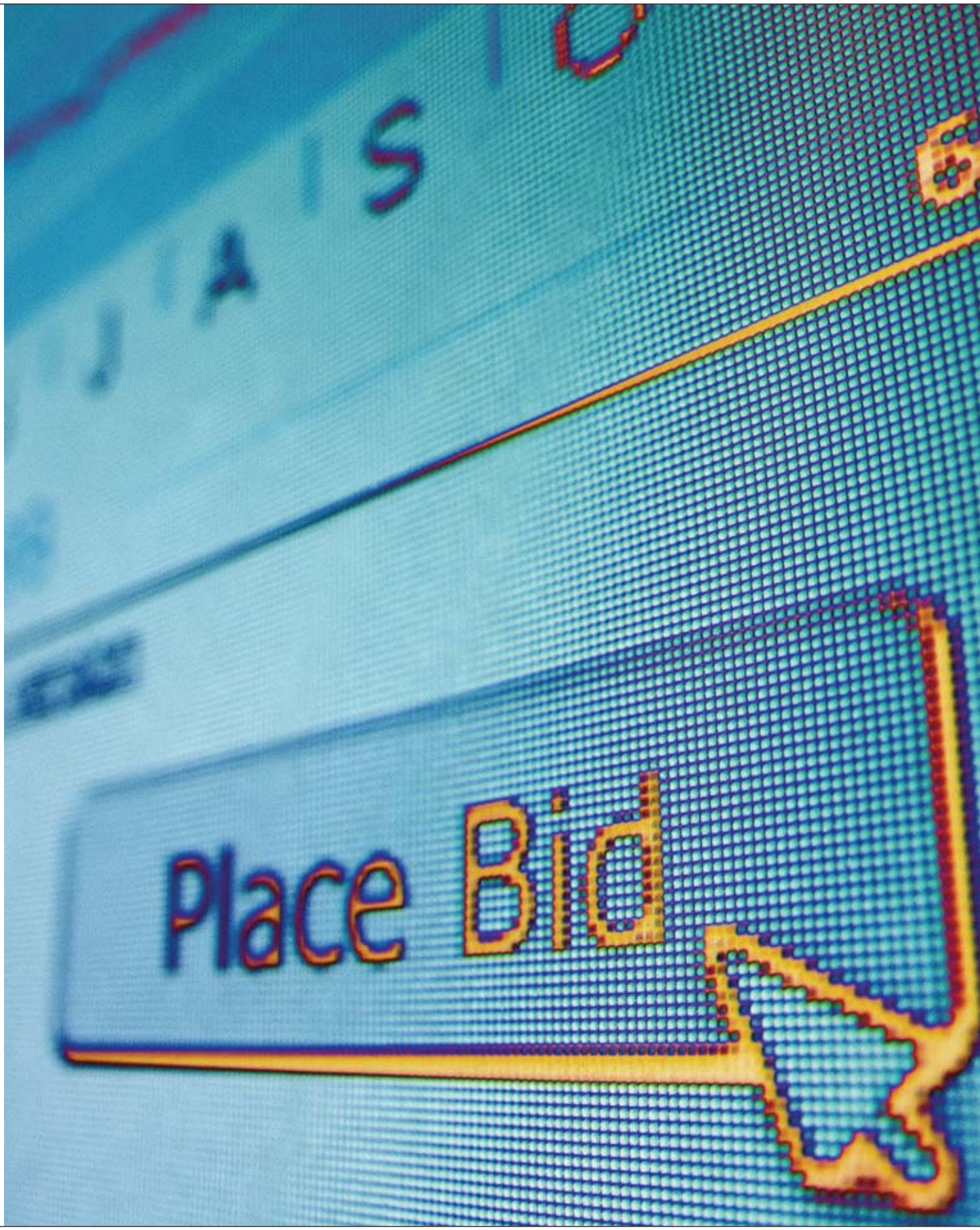

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People not only try to maximize their gains but also watch to see that they get roughly the same share as others.

GETTY IMAGES

single-mindedly strives for maximum profit. According to this notion, sellers should pocket buyers' payments and send nothing in return. For their part, buyers should not trust sellers—and the market should collapse.

Economist Axel Ockenfels of the University of Cologne in Germany and his colleagues have spent the past several years figuring out why this does not happen. It turns out that humans do not always behave as if their sole concern is their personal financial advantage—and even when they do, they consider social motives in the profit-making equation [see "The Samaritan Paradox," by Ernst Fehr and Suzann-Viola Renninger; SCIENTIFIC AMERICAN MIND, December 2004]. As Ockenfels has discovered, a sense of fairness often plays a big role in people's decisions about what to do with their money and possessions, and it is also an essential part of what drives trust in markets full of strangers such as eBay.

Ockenfels's Equity, Reciprocity and Competition (ERC) theory, which he developed with economist Gary Bolton of Pennsylvania State University, states that people not only try to maximize their gains but also watch to see that they get roughly the same share as others: they are happy to get one piece of cake as long as the next person does not get two pieces. This fairness gauge apparently even has a defined place in the brain [*see box on opposite page*]. On eBay, however, fairness takes the system only halfway, researchers have now learned; eBay's reputation system is critical for augmenting the level of trust enough for the market to work.

Circumstance also sculpts behavior, studies have revealed, regardless of natural character traits or values. That is, whether a person is competing in a market of strangers or negotiating with a partner can make a big difference in whether fairness, reciprocity or selfishness will predominate. In fact, the ERC theory hints at ways to alter economic institutions to nudge people to compete—or cooperate—more or less than they currently do.

Playing Fair

Economists have long been studying volunteers in the laboratory to determine how and why they make financial decisions. In competitive markets, from the U.S. Stock Exchange to auctions at Sotheby's, people generally act like *Homo economicus*, behaving in ways that maximize their own profits.

But inherent selfishness cannot explain behavior in other settings. Take a child who has been given a bag of jelly beans, which her left-out sibling is eyeing jealously. Many children would voluntarily share the candy just to be fair, even though that would mean fewer jelly beans for them. Mathematicians who practice game theory see something similar when they ask people to bargain in a test of social motives called the Ultimatum Game. In this two-player game, player A is endowed with a certain sum, say, $20, if he

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agrees to share some of it with player B. If B accepts A's offer, the money is divided accordingly. But if B rejects the offer, both players end up with nothing.

In Ultimatum Game studies, researchers have found that the average offer is about 40 percent of the sum and that the most frequent split is 50–50, analogous to a child giving her sibling half or nearly half of the jelly beans she received. The recipient, B, usually accepts such roughly equal offers. When A offers less than one third of the total, however, B usually reacts with scorn and scraps the deal. This response seems nonsensical to someone who is only out to maximize profit. But it is more logical if people have a competing social concern: fairness. If individuals want a fair split, then accepting significantly less than that would mean forfeiting that objective.

A motivation for fairness also seems to be an important factor on eBay, in which the "Buy It Now" format—or an auction with just one buyer—resembles an Ultimatum Game; a seller offers an item at a price that a buyer can accept or reject. To test this hypothesis, Ockenfels and Bolton recruited 100 German university students with selling experience on eBay, divided them into 50 buyer-seller pairs, and asked the sellers to hawk $20 certificates (funded by the researchers) to their assigned partners on eBay.

Consistent with previous Ultimatum results, the most popular selling price was $10, which would result in an equal split of the experimental pot. All but one buyer accepted this offer. Prices above $17 were uniformly rebuffed as too greedy, and some also refused costs between $10 and $17, refuting the idea that monetary incentive alone

Arbiters of Fairness

Economic decision making has its place in the brain, where two different regions may compete for supremacy in guiding a person's acceptance or rejection of unfair offers. Cognitive neuroscientists Jonathan D. Cohen of Princeton University and Alan G. Sanfey, now at the University of Arizona, and their colleagues used functional magnetic resonance imaging (fMRI) to detect changes in neural activity in the brains of 19 subjects as they played the Ultimatum Game. Unfair offers, they found, spurred much greater activity in the anterior insula—part of the brain's limbic system associated with disgust and other negative emotions—than fair offers did. And the more unjust the offer, the greater the anterior insula activity.

Commotion in the anterior insula also correlated with rejection, as the participants who showed strong activation in this region in response to skewed offers rebuffed more of those offers than people whose anterior insula responded more weakly to the same unequal splits. Rejection of unfair deals was also strongly tied to the degree of anterior insula activity *relative* to that of the dorsolateral prefrontal cortex, a frontal brain region involved in planning, reasoning and, probably, maximizing profits, the researchers reported in 2003. Thus, these two brain regions may be at war in the Ultimatum Game and on other occasions when decision making spurs a duel in the mind between the emotional goal of resisting unfairness and the cognitive ambition to amass wealth. —*C.U.*

When a person gets an unfair offer in the Ultimatum game, three areas of that person's brain become particularly active: the dorsolateral prefrontal cortex (*large orange area, brain on left*), the anterior cingulate (*central orange area, both brains*), and the anterior insula (*two lower orange areas, brain on right*). When the emotional anterior insula is more active than the rational dorsolateral prefrontal cortex, unfair Ultimatum offers tend to be rejected. When the regions' relative activation levels are reversed, these offers tend to be accepted. The anterior cingulate gears up to resolve the conflict between the two warring regions.

SOURCE: "NEUROECONOMICS: CROSS-CURRENTS IN RESEARCH ON DECISION-MAKING," BY A. G. SANFEY, G. LOEWENSTEIN, S. M. McCLURE AND J. D. COHEN, IN *TRENDS IN COGNITIVE SCIENCES*, VOL. 10, NO. 3; 2006. COURTESY OF LEIGH NYSTROM AND ALAN SANFEY

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governs the deal. On the contrary, in this bargaining situation an equal split maximizes profits, Ockenfels says, because buyers generally will not accept unfair offers and sellers seem to realize that. "Fair dealing pays off," he concludes.

Different Strokes

In many cases, however, people will forgive a biased outcome if it comes about by chance rather than through a deliberate act. Ockenfels and Bolton recently asked volunteers to play an Ultimatum Game variant in which player A chooses to split the money either 50–50 or 80–20. If the choice was 80–20, 41 percent of recipients refused the offer. But only 7 percent rejected the 80–20 split when it came from a robot acting at random. This result, Ockenfels says, suggests many people will accept unequal deals as long as all participants have been given a fair chance.

Not everyone is the same, of course. The demand for such procedural fairness, in which people get equal treatment even if the outcome is unfair, may have a cultural component. Anecdotal evidence suggests, for instance, that Americans may be more concerned with procedural fairness than Germans are. Germans seem more likely to insist on equivalent outcomes, Ockenfels says. Individual differences matter, too. Some people are very sensitive to being cheated, whereas others are far less bothered, even nonchalant, when they receive unequal treatment.

That said, discerning values from behavior is

> A fair player cannot strive for equity in a situation in which each person must outbid others to get anything at all.

PETER FOLEY *epa/Corbis*

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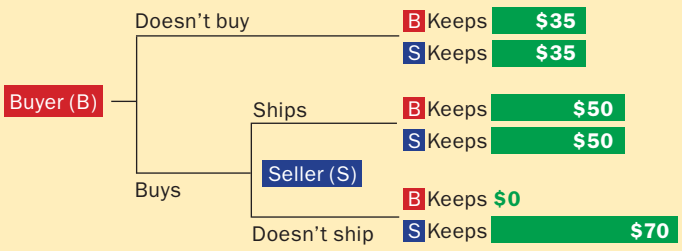
Explaining Trust

To probe what motivates the trust displayed by buyers and sellers on eBay, researchers at the University of Cologne in Germany and Pennsylvania State University developed two games. The first, the Basic Trust Game, mimics eBay. A seller and a buyer each start off with the same sum: $35; additionally the seller has an item for sale at $35. The cost of shipping (paid here by the seller) is $20. The item's value to the buyer is $50. So a trade at $35 nets each participant $15 in value. But if the buyer sends in $35 and the seller fails to ship the item, the seller ends up with $70 and the buyer gets nothing. If the buyer chooses not to take this risk, no trade occurs.

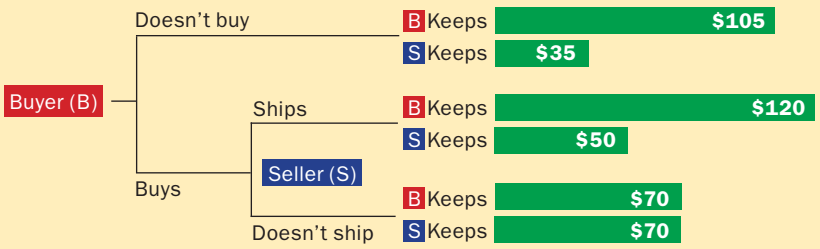
In a recent study, 37 percent of volunteers were willing to ship, suggesting that some sellers were motivated by fairness, because outcomes are equal if they ship; 27 percent of buyers had bet on that fairness and were thus willing to buy. (On eBay, a feedback system boosts trust—and shipping—to much higher levels.)

To further test whether fairness governs trust, the researchers constructed an Asymmetric Trust Game in which the outcomes are equal when *no* shipping occurs, because the buyer receives an extra $70 regardless of the transaction. As predicted, very few sellers (only 7 percent) shipped, solidifying the idea that fairness motivates trust in such an exchange.

BASIC TRUST GAME



ASYMMETRIC TRUST GAME



SOURCE: "TRUST AMONG INTERNET TRADERS: A BEHAVIORAL ECONOMICS APPROACH," BY G. E. BOLTON, E. KATOK AND A. OCKENFELS, IN *ANALYSE & KRITIK*, VOL. 26; 2004.

often hopelessly confounded by circumstance, Ockenfels says. When he and Bolton asked people to compete for their $20 certificates in experimental eBay auctions with one seller and nine buyers each, they found that the selling price zoomed above $19, a far cry from the equal split that pervaded the previous one-on-one game. *Homo economicus* trumped fairness in the auction, because a fair player has no way to strive for equity in a situation in which each person must overbid the others to get anything at all. "In markets, all people behave selfishly, but that doesn't mean they really are," Ockenfels comments. "The institutions make you behave in certain ways."

Building Trust

In the researchers' experimental auction, trust was not a factor, because the (presumably trustworthy) experimenters vouched for the $20 certificates. Yet trust is a critical issue on eBay, in which sellers are anonymous and have little pecuniary incentive to actually ship the items they have sold.

To figure out why they ship anyway, Ockenfels, Bolton and Penn State business professor Elena Katok asked 144 university students to play a trust game that mimics the situation on eBay. In the game, a seller and a buyer each start off with the same sum, say, $35; that is the payoff when no trade takes place. The seller also has an item to be sold for $35, but its value to the buyer is $50, so a trade nets the buyer an extra $15. The seller pays the shipping costs here, $20, so a trade also nets the seller an additional $15. But if the seller fails to ship an item, the seller receives a $35 bonus and the buyer loses the entire endowment. If the buyer chooses not to take

(The Author)

CHRISTOPH UHLHAAS is a philosopher who studied at the University of Cologne in Germany. After many years on eBay, he believes that his fellow dealers play fair.

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this risk, no trade occurs [*see box on preceding page*].

In this game, the outcome is fair after either a successful trade or no trade—but most advantageous to the seller if the seller fails to ship. *Homo economicus* would thus never ship, and no rational buyer would buy. But 37 percent of the sellers were willing to ship, the researchers found, suggesting that some sellers were motivated by an intrinsic sense of fairness and some buyers had bet on that. And in a modified trust game that endows the buyer with an extra $70 regardless of the outcome, the researchers predicted that fair-minded sellers would *not* ship, because that choice would equate buyer and seller sums at $70. As expected, many fewer sellers (only 7 percent) decided to send the fictitious goods, signifying that the main reason for trustworthiness is fairness.

Rumor Has It

Nevertheless, sellers must ship as much as 70 percent of the time for buying in such a game—or on eBay—to be profitable, according to Ockenfels. How does eBay boost trust to that level? The answer: feedback. On eBay, sellers and buyers can evaluate one another after a transaction has been completed, and these evaluations are made public for future buyers and sellers. "This reputation system functions like an organized rumor mill and replaces the gossip systems of the off-line world," Ockenfels explains. Because a bad reputation scares off future buyers, even strategic and rational sellers have an incentive to be trustworthy.

To quantify the power of this rumor mill, Ockenfels and his colleagues compared market activity among strangers matched for 30 rounds of transactions without a feedback mechanism against a similar market that included feedback. They found that the feedback system elicited significantly more buying—56 percent—as compared with buying without it—37 percent. More shipping also occurred, rising to 73 percent—above the threshold for trust to be profitable—as compared with shipping for transactions without the reputation system: these hovered around 39 percent. The results

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How to Succeed on eBay

>>Check the seller's record. Any negative ratings should make you distrustful. You may also want to avoid a seller who has few ratings or one who has experience with only inexpensive items when you are considering a pricier product.

>>Beware of superlatives. Sellers who describe their wares as "rare" or "in unusually good condition" are significantly more likely to cheat customers, according to a 2006 study of eBay auctions.

>>Don't overbid. Decide how much you are willing to pay. Check the price at other online merchants if the item is commercially available.

>>Add shipping and handling. Sellers sometimes set exaggerated shipping rates to inflate profits. Add these costs to your bid to get the true price.

>>Try tricky bids. Add a fractional amount to your maximum bid; rather than $10, offer $10.50. Your competitors may have calculated an identical maximum bid, but without the margin, giving you an edge.

>>Bid only once. Do not raise your bids repeatedly during the auction. As the bidding heats up, you may end up paying too much.

>>Bid late (sniping). Bid only during the last few minutes of an auction. Your competitors may not have a chance to outbid you, and early bids tend to drive the price up. If last-minute bidding isn't practical for you, use an automatic bidding system, or "e-sniper," to bid for you. The Internet abounds with downloadable options.

Speaking of shipping: This large vessel was recently for sale on eBay.

>>Don't bid on the rebound. If you lose, keep your cool—and don't bid on anything else until the next day. You may pay too much out of frustration. Three quarters of auction winners do pay too much, according to another 2006 study. In 43 percent of all auctions, the final sales price is higher than the price in stores—and if you include shipping, the share rises to 72 percent.

indicate that feedback can fill the trust gap in a market such as eBay's, multiplying the impact of intrinsic trustworthiness.

But the feedback system is imperfect. About 98 percent of ratings on eBay are positive, according to Ockenfels, suggesting that some disappointed eBay buyers do not post negative ratings. Buyers may fear "revenge feedback," when a seller retaliates for a bad rating with a negative rating of the buyer, claiming that the buyer paid late or with a bad check, for instance. Indeed, in Ockenfels's experiments, many of those who are not happy with a trade do not give feedback at all.

This lack of feedback is obviously not good for the reputation system. So Ockenfels and Bolton, along with economist Ben Greiner, now at Harvard University, have been working with eBay to design choices that induce people to post truthful and detailed negative feedback. eBay's revised format, Feedback 2.0, debuted April 30. It lets buyers rate transaction specifics such as accuracy of an item's description, seller communication and shipping speed, in addition to the overall rating of positive, neutral or negative.

The extra detail increases the feedback's value to future buyers. And to help allay worries of retaliatory feedback, buyers give their ratings anonymously. Furthermore, sellers can see the detailed ratings only *after* providing feedback of their own, preventing retaliatory feedback even if the seller later intuits which buyer posted a poor evaluation. What the new system cannot prevent, however, is one-time cheaters. Buying a car or plane online is still pretty risky.

Ockenfels is not about to do that. He visits eBay only occasionally, to buy things for his two children. And if you notice an auction with "aockenfels" as the seller, you have probably stumbled on an economics experiment. M

EBAY

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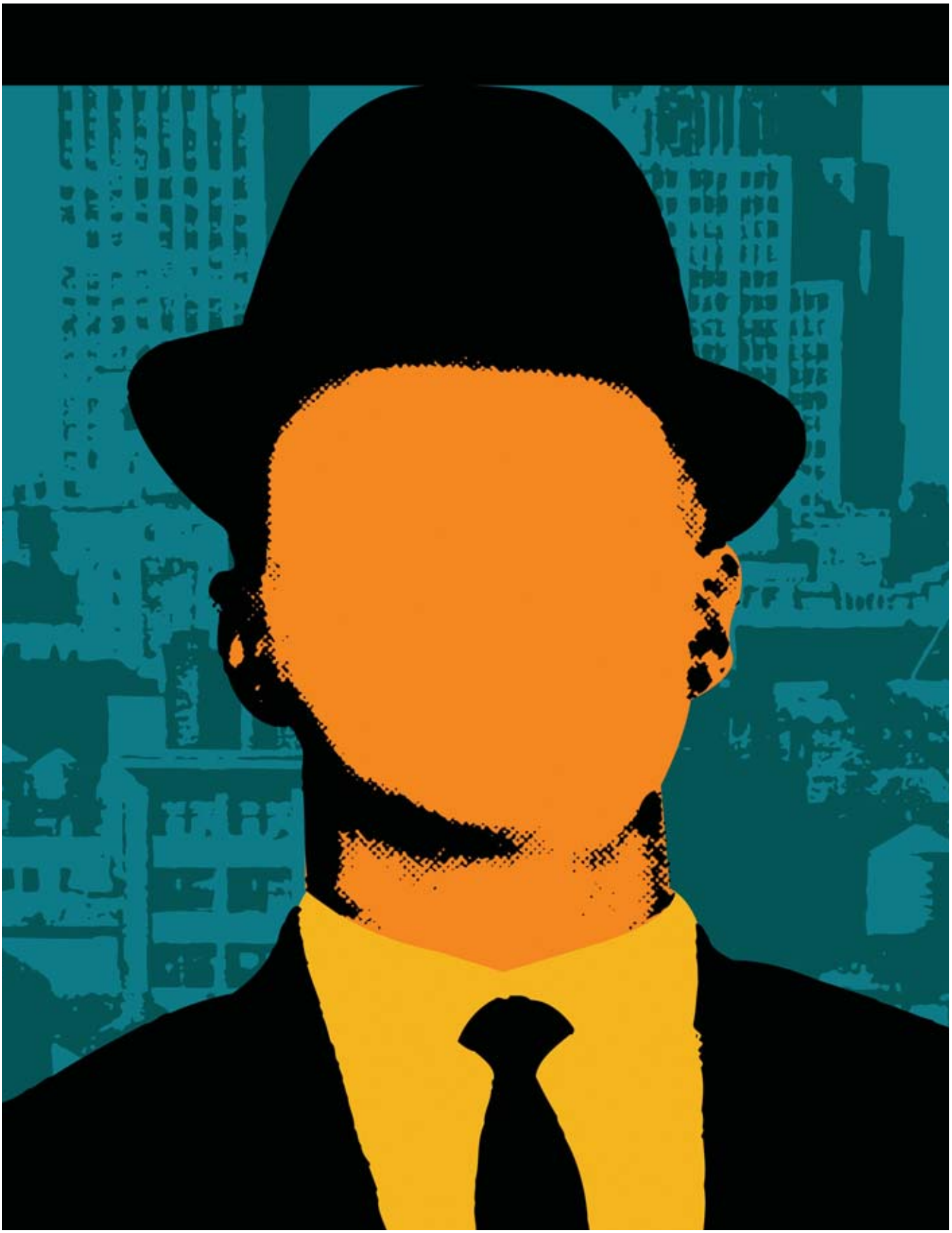

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They do not recognize friends or family members or even themselves in a mirror. Researchers have recently discovered that an astounding 2 to 3 percent of the population may be effectively blind to faces

Forgetting Faces

By Thomas Grueter

Once, in broad daylight, Bill Choisser encountered his mother on a sidewalk in a local shopping district. He walked toward her and passed her within two feet. He said nothing as he ambled by—an omission for which his mother has never forgiven him, or so he writes in his online book, *Face Blind!* Choisser meant no ill will toward his mother, however; he simply did not recognize the woman who raised him.

Many people have trouble remembering names. Choisser cannot remember faces, a condition known as prosopagnosia. People like Choisser can see faces, but they cannot keep in mind what particular people look like. The fact that all visages contain basic features such as a nose, mouth and eyes makes every face appear essentially the same to them, like so many stones paving a gravel driveway. As a result, features hold just about as much fascination for them as ridges on a rock.

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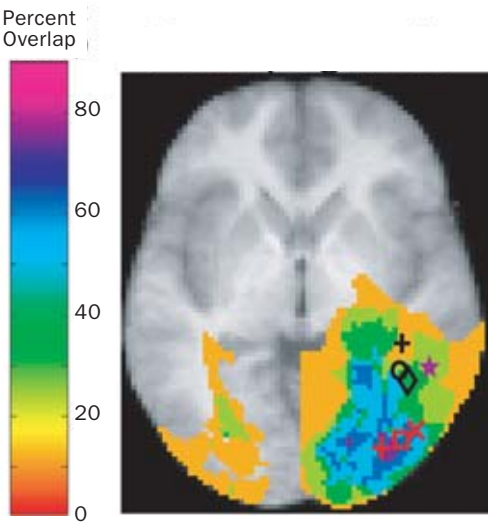
Visages in the Brain

Researchers at the University of California, Los Angeles, identified somewhat dispersed brain areas involved in face recognition by matching up the regions of damage documented from patients with acquired prosopagnosia, an inability to remember faces because of brain injury or disease. The purple and dark blue regions indicate the greatest overlap in the patients' lesions, followed by light blue, green and yellow. The sections of high overlap—sites that were damaged in the most patients—very likely play an essential role in face recognition. Indeed, some of those areas coincide with regions activated in imaging experiments that probe face processing; these activity hot spots include the fusiform face area (*black symbols*), the occipital face area (*red symbols*) and the superior temporal sulcus (*purple symbol*).



Until very recently, such selective face blindness was thought to be extremely rare, with perhaps 100 documented cases worldwide—and most of them people who had acquired the condition as a result of head trauma, stroke or brain disease. In the past few years, however, my wife, Martina Grueter, and I, along with her colleagues at the Institute of Genetics in Muenster, Germany, have revealed that a surprising number of people are born with prosopagnosia.

Our surveys, along with those conducted by cognitive neuroscientists Ken Nakayama of Harvard University and Brad Duchaine of University College London, indicate that this perceptual quirk resides in 2 to 3 percent of people. If this is true, up to six million prosopagnosics reside in the U.S. alone. Many of them do not realize that their perception is abnormal, because they have always been this way—perhaps explaining why the disorder has gone unrecognized for so long. Prosopagnosia also seems to run in families, as our recent work shows, and may be caused by a change in a single gene.

Given the importance of faces in human interactions, a difficulty in perceiving them can be socially and professionally crippling, causing embarrassment, confusion or worse when a person fails to recognize a close friend, family member, customer, boss or colleague. Some prosopagnosics attempt to avoid casual encounters in public places because they fear humiliation. Most use various tactics for hiding their deficit. And although individuals with prosopagnosia can glean emotional and other clues from faces, they often do not, because they fail to look at a person's countenance—its features are so unimportant to them.

In young children, prosopagnosia can cause excessive clinginess to parents, according to our ongoing investigation at the University of Vienna in Austria. Children with face blindness also may require months to learn to recognize their school classmates, making school transitions difficult. Variations in the appearance of others—such as a new beard or a pair of glasses—can also be disconcerting to affected kids be-

FAST FACTS

Strangers Everywhere

1» People with a disorder called prosopagnosia do not recognize the faces of friends, relatives or acquaintances. They cannot recall the nuances that make each visage distinct.

2» Two to 3 percent of all people are born with prosopagnosia, which until very recently was thought to be extremely rare and largely caused by brain injury or disease.

3» Prosopagnosics cannot be cured, but they can and do learn other ways of recognizing people. Strategies include memorizing what certain individuals wear and how they style their hair, as well as their gait and their speech patterns.

SOURCE: "BEHAVIORAL DEFICITS AND CORTICAL DAMAGE LOCI IN CEREBRAL ACHROMATOPSIA," BY S. E. BOUVIER AND S. A. ENGEL, IN *CEREBRAL CORTEX*, VOL. 16, NO. 2; 2006

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An alteration in a single gene could lead to prosopagnosia, an inability to recognize faces.

cause, we have found, such changes disrupt their fragile memories of those faces. Once identified, children with prosopagnosia can be given practical pointers and assistance that enable them to better cope with their deficit and thereby decrease their feelings of frustration, embarrassment and isolation.

Short Circuit

Face processing occurs in many regions of the brain, but imaging studies indicate that the so-called fusiform face area, a subdivision in the brain's temporal lobes—large sections of the outer brain that sit over the ears—is especially important. The occipital face area near the back of the brain may also play a role in categorizing an object as a face. And the superior temporal sulcus, also in the temporal lobe, has the job of responding to changes in a person's expression or viewing angle [*see box on opposite page*].

The notion that a short circuit could occur selectively in the brain's face-recognition machinery emerged in the 1940s, when a German neurologist, Joachim Bodamer of the Winnental Sanatorium near Stuttgart, examined two patients who had sustained severe head injuries in World War II. Bodamer noted that although the men could still see faces, they could no longer *place* them. He concluded that seeing and recognizing faces represent different brain functions. In a 1947 paper Bodamer coined the term "prosop-agnosia" from the Greek *prosopon,* or face, and *agnosia,* meaning nonrecognition or without knowledge.

Over the next several years, physicians noted the same phenomenon in victims of stroke and other neurological damage, particularly when brain tissue had been destroyed at the transition between the occipital and temporal lobes. The first case of congenital prosopagnosia, however, did not appear in the medical literature until 1976: a girl who recognized her school classmates only after studying their voices and clothing for a month or two. And over the next 25 years, only about a dozen more such cases came to light.

Loss of Face

I have prosopagnosia. I easily overlook people I know in public spaces such as airports or shopping malls. I do not define people by their facial features per se but by a patchwork of other characteristics such as their typical expression, gait and voice. I have always known that I had a deficit in facial recognition, but it never occurred to me that it might be a medical condition until 2001, when Martina happened to see a TV show on prosopagnosia. I suddenly realized that its symptoms matched my own.

So I then asked a doctor at the Institute of Genetics in Muenster if an inability to recognize faces was a known congenital condition. He replied that it was not. Still curious, however, Martina typed the German term for "face blindness" into Google and quickly turned up two German women who reported problems recognizing faces. From there, she tracked down more candidates by posting queries on relevant Web forums and thereby launched a study that would become her M.D. thesis.

Ninety people agreed to be interviewed for signs of the disorder, and she found clear evidence of prosopagnosia in 31 of them, a number we found hard to believe in light of the paucity of known cases. But we confirmed our diagnoses using face-recognition tests and repeat interviews conducted by specialists from Cardiff University in Wales. The affected subjects were clustered in six families, including our own, which further suggested the existence of an inherited disorder, Martina reported in 2004.

Convinced that we were onto something, Martina and I, along with her Institute of Genetics colleagues, then probed the prevalence of prosopagnosia in the general population. We gave written questionnaires to students from three local secondary schools as well as medical students from the University of Muenster, and we selected for follow-up questioning the 10 percent of respondents whose answers hinted they might have the disorder.

We interviewed these subjects to determine, for example, whether they lacked confidence in recognizing people; had prepared excuses when greeted by somebody they could not identify (an

(The Author)

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Wising Up to Faces

Parents and teachers can help children with prosopagnosia to better cope with their deficit. Here are some tips:

- Encourage affected children to look at people's faces when they are socializing. This practice not only makes others more comfortable but also helps kids with prosopagnosia read information the face conveys such as health, age and mood.
- Introduce potential playmates slowly, pointing out characteristic features such as freckles, tall stature or an unusually high-pitched voice. When referring to other children, link their names to an obvious physical trait. For example, say, "Please take the book to Katie with the red hair."
- Expose children with face blindness to their school and teacher before the first day of classes to ease the transition when school starts.
- Teachers should try to keep their appearance as stable as possible during the first days of school—refraining from swapping accessories or eyeglasses, for example.
- Play introduction games that involve talking—to help children with prosopagnosia memorize other children's voices in lieu of their faces.
- Post photographs of classmates and friends, along with their names, on a wall to facilitate recognition.

indication that they frequently find themselves in this predicament); or often tried to avoid people in public places. Because of the awkwardness of being unable to recognize someone who knows you, face-blind individuals will often try to steer clear of chance encounters by, say, crossing the street or pretending to talk on a cell phone when they see someone approaching.

Most of those we interviewed, however, showed no abnormalities. (A number of them were simply shy.) But 17—or 2.5 percent of the 689 students surveyed—met our criteria for prosopagnosia. We then interviewed the close relatives of the 14 affected pupils who agreed to participate, and we discovered that every one of their families contained other members with prosopagnosia.

Our results, which we reported in 2006 in the *American Journal of Medical Genetics,* suggest that if a parent displays this perceptual weakness, a child stands a 50 percent chance of exhibiting it, too. An alteration in a single dominant gene could account for this pattern of transmission; only one copy of such a gene—from a mother or father—is required to transmit the trait.

By then, we were not the only ones hot on the trail of face blindness. In a 2006 Harvard press release Nakayama and Duchaine reported surveying 1,600 participants on the Internet for the presence of prosopagnosia using a series of face-recognition tests. Concordant with our results, about 2 percent of their subjects had serious difficulty recognizing faces.

Are You My Mother?

A tendency to pay attention to faces is present from birth, but such perception does not completely mature until the teenage years. Nevertheless, we assumed that the effects of an inherited disorder would show up early. So last year my wife and I, now at the University of Vienna, began investigating the impact of prosopagnosia on children by interviewing the mothers of boys and girls diagnosed with the condition.

As babies and toddlers, the mothers told us, such children tend to be unusually anxious whenever their mother leaves the room and often object when their grandparents pick them up. Although wariness of strangers is normal in an eight- to 12-month-old child, this apprehension seems to linger much longer in children with prosopagnosia. "It was torture for me whenever the toddler group got together," one mother recalled. "All the other children played happily together except for Stephanie, who sat anxiously on my lap and refused to get involved." Because she could not reliably recognize her mother, Stephanie feared that she would not be able to find her mother again if she separated from her.

As with other children who are face blind, Stephanie required a long time to get used to the playgroup and to be able to recognize individual playmates. In many cases we heard about, a toddler had been unable to tell whom he or she had played or fought with half an hour earlier. The mothers also noted that their face-blind children would often become irritated when their mom changed her hairstyle or wrapped her head in a towel after bathing. Any such variation can disrupt the child's tenuous memory of the mother's appearance and thus make her more difficult to recognize.

The difficulties continue into elementary school. "It took Anna half a year to warm up to the other kids," one mother told us. Her teacher complained that Anna seemed unfocused in class because her gaze wandered. But Anna did well in school, and she explained that she could follow the teacher better if she did not have to look at anyone.

The disorder can cause logistical problems for kids, too. One mother, who is also affected, recalled a time in grade school when she mistak-

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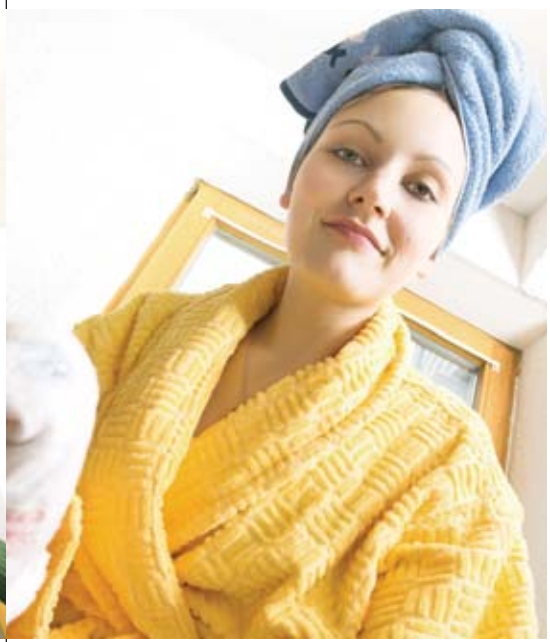
Young children who are face blind worry they won't find their mothers again if they separate from them.



People are strange: To someone with prosopagnosia, a friend or relative may become unrecognizable when she changes clothes, dons glasses or wraps her head in a towel.

enly went to the wrong classroom after the room had been reassigned. Because she could not tell that the other children in the room were not her usual classmates, she remained in the wrong room until the teacher arrived and informed her of her mistake.

Teeth and Shoes

There are as yet no therapeutic solutions for prosopagnosia. Still, children with the deficit can be taught other ways to recognize people (among other coping techniques) [*see box on opposite page*]. These include memorizing what people wear and how they style their hair, as well as their gait and their speech patterns. By age 14, affected individuals have typically come up with such tactics on their own. One dentist told us she identifies people by looking at their teeth when they are smiling. Another prosopagnosic eyes men's shoes on the assumption that men own very few pairs.

Of course, such crutches do not work as well as a fully functioning face-recognition system. Thus, the deficit is persistently disabling, often in the most embarrassing ways. "I was having a wonderful conversation with a woman at a party, but then I went to get us some drinks," one young man sheepishly recalled. "When I returned, I had forgotten what she looked like, and I was unable to find her the rest of evening. She must've thought I was a complete idiot!"

More widespread understanding of the condition could ease much of this awkwardness. It also could have important practical payoffs. Screening eyewitnesses slated to testify in court for prosopagnosia could be beneficial, for example.

Meanwhile researchers are actively searching for the prosopagnosia gene. Finding this genetic quirk would not only advance the biological understanding of face perception but also enable doctors to diagnose the condition in very young children. And the earlier children can be properly identified as face blind, the better the chances that these kids will get the help they need to happily find their way in the world. M

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- **Prosopagnosia in Biographies and Autobiographies.** Thomas Grueter and Martina Grueter in *Perception,* Vol. 36, No. 2, pages 299–301; 2007.
- Learn more about what it is like to be face blind at **www.choisser.com/faceblind/**
- A link to the prosopagnosia research centers at Harvard University and University College London: **www.faceblind.org**
- Research papers on prosopagnosia can be found at **http://neurodiversity.com/prosopagnosia.htm**

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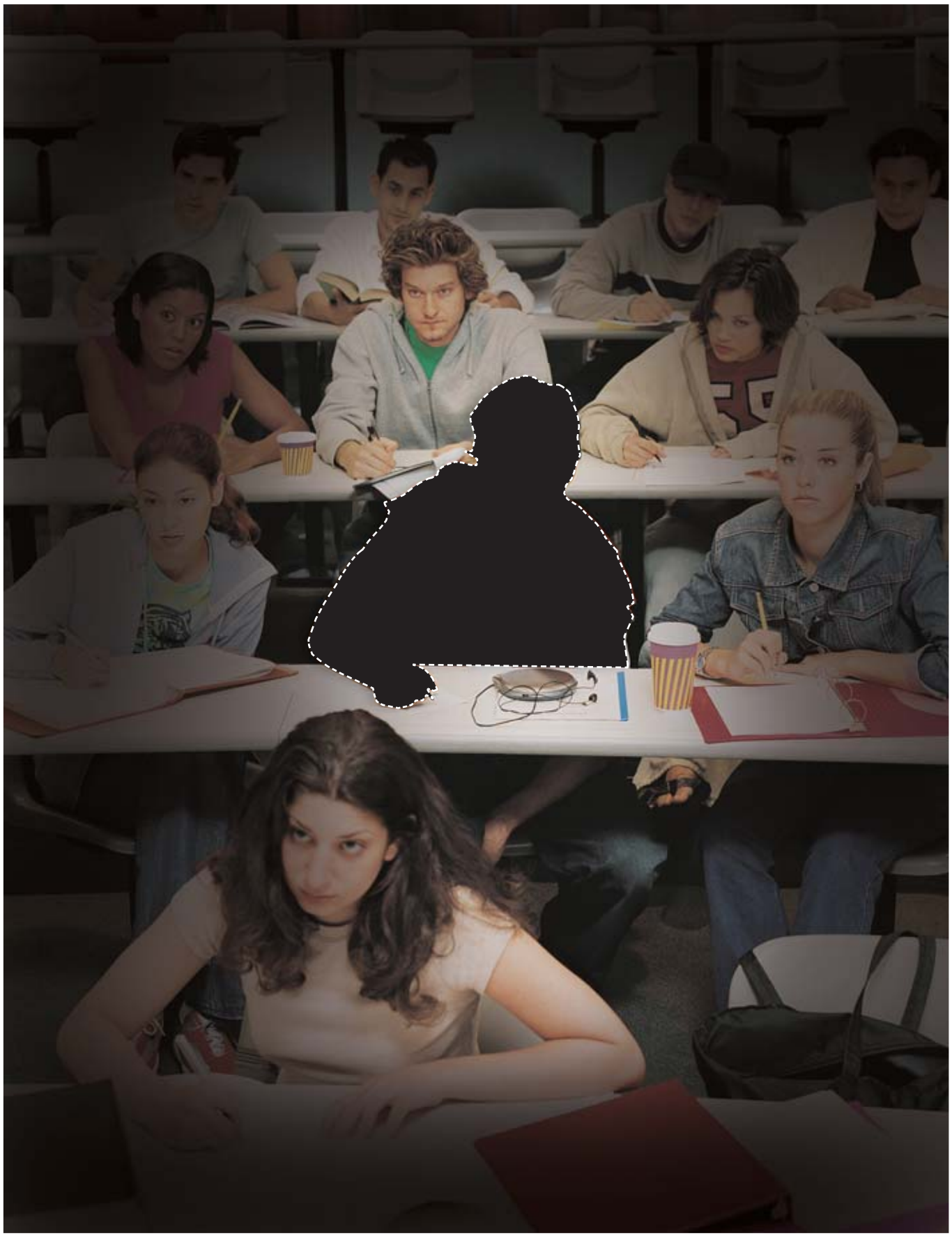

GETTY IMAGES

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In the U.S., more students drop out of college than graduate—yet six out of every 10 jobs require a postsecondary education.

Why We Quit

What causes so many students to squander their future?

By Yvonne Raley

In her 20s, Diana dreamed of becoming a scientific illustrator. She had not yet attended college, so she was thrilled when she received an acceptance letter from an undergraduate graphic arts program in New York City. But her excitement gave way to anxiety during the first days and weeks at her new school. Fretting about her performance, Diana sought out her professors for comfort and advice. She found them aloof and difficult to contact, however, because none of them posted office hours. When Diana reached out to the chair of the art department, he either was unavailable or expressed little interest in her concerns.

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Whether a person **stays in college** can depend on how well she socially integrates into the college community.

LORI ADAMSKI PEEK *Getty Images (photograph)*; SOURCE: U.S. CENSUS BUREAU *(data)*

Diana's academic fears were unfounded—her first semester grades turned out to be quite good. But lacking contact and support from her teachers, Diana felt lonely, dejected and lost in the crowd. She was so disillusioned, in fact, that she abruptly dropped out of college—and never went back. Now 38, Diana teaches English as a Second Language part-time for an international language school. Her pay is $10 per hour, and she has no opportunity for advancement.

Stories like Diana's play out all over the country. Graduation rates at public four-year colleges and universities hover at around 40 percent of entering students. Their private counterparts fare only slightly better; 57 percent of their newly minted freshmen go on to graduate. Two-year public colleges have a worse record, graduating fewer than 30 percent of their students. The record has not improved in three decades, although more people attend college now than in the past.

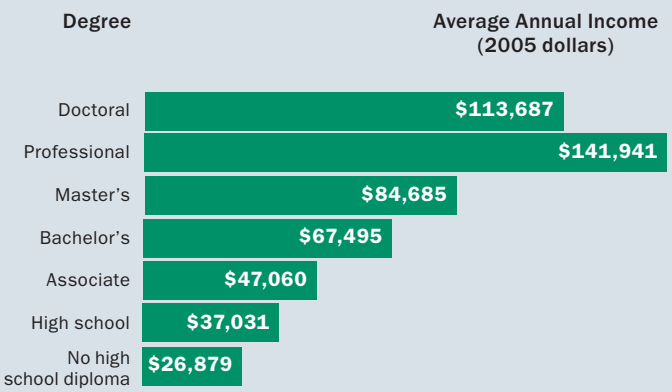
And, as Diana discovered, failing to graduate from college hampers future career prospects. Consider these statistics: six out of every 10 jobs require a postsecondary education; adults younger than 25 are more than twice as likely to be unemployed if they lack a bachelor's degree; for those 18 and older, having a bachelor's raises average annual income by roughly 80 percent as compared with having only a high school diploma [*see box below*]. This gap will most likely expand if historical trends continue: in recent decades the income of people with a bachelor's or advanced degree has steadily risen relative to those with only a high school diploma [*see box on opposite page*].

Researchers have long tried to identify the causes of the alarmingly high college drop-out rates. Now many educators believe that most students who leave without finishing have failed to make a successful transition from high school to college because of a poor fit with the institution the individual has chosen. Numerous factors play into this fit, including a student's values and family background, academic self-confidence and skills, and social and extracurricular preferences. When a disconnect occurs, as in Diana's case, a student may feel lost almost immediately: most college dropouts, whether from public or private schools, leave by the end of their freshman year.

Given the variety of obstacles over which a first-year student may stumble, no one can afford to assume that any young person, no matter how academically gifted, is certain to succeed in college. Rather students, parents and educators alike need to anticipate possible problems and take steps to prevent them. For example, students need

Education Pays

A college graduate may earn close to double what a high school graduate takes home in a year. And earnings for full-time workers ages 18 and older continue to rise with education level.



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to assess their personal, social, and academic strengths and preferences carefully *before* entering college to raise the chances of picking a school that is right for them. Taking precollege summer programs and, in some cases, selecting remedial undergraduate courses can help many students or prospective students better handle the intellectual rigors of college [*see box on next page*].

Fitting In

Although studies of college dropouts date back at least 70 years, the field experienced a resurgence in the 1960s and 1970s, when postsecondary education became widely available to women, minorities and low-income families. In the early 1960s psychologist John Summerskill of Cornell University was among the researchers trying to better understand the dynamics of a diverse student population by examining retention through a psychological lens, pinpointing personality aspects—such as maturity level and motivation—that affect drop-out rates.

In 1971 sociologist William Spady, who held positions at Harvard University and the Ontario Institute for Studies in Education at the University of Toronto, added a community dimension to the retention puzzle. In Spady's view, the problem of keeping students was a function of the interaction between certain characteristics of the individual—such as his or her values, interests and skills—and the campus environment. Several years later Syracuse University education researcher Vincent Tinto expanded on this idea, theorizing that whether a student stays in college pivots on the social and academic *integration* of that person into the college community. More than just going to a new school, Tinto realized, entering college is a rite of passage in which students must make a transition from the community of their childhood—their family, high school, hometown—to that of the college in which roommates stand in for siblings, trusted teachers for parents, and a dorm in a new town for home.

Students may falter during this transition for any number of reasons, Tinto speculated. Some may have trouble finding friends and thus fail to socially integrate. Others may find that their culture or values are at odds with those of the new community. For example, an African-American student may feel out of place in a school where virtually all his peers are white. Similarly, a devout Catholic student may have difficulty accepting the values of a secular college. A studious person who ends up in a party dorm may encounter an uncomfortable mismatch between her priorities and those of her classmates.

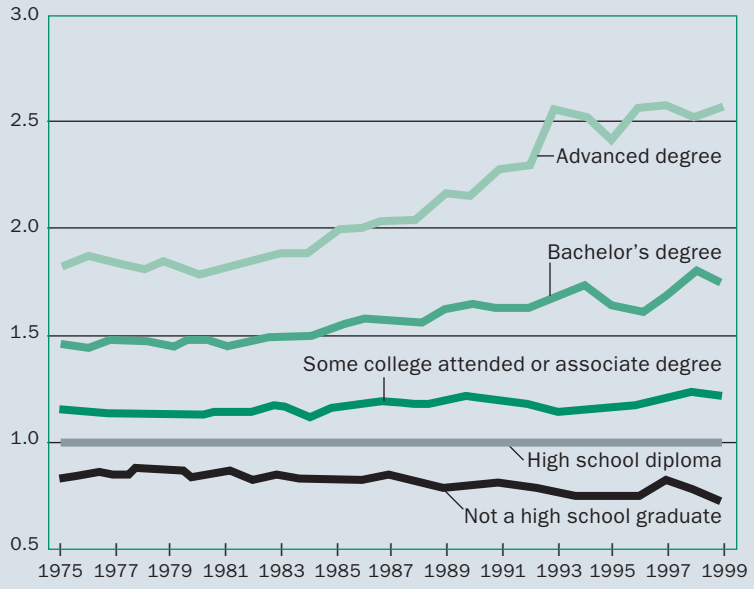
Students who successfully assimilate, on the other hand, are generally those whose values, cultural background and academic interests match those of the college they have chosen, Tinto argues. And more students will happily integrate, he adds, if the school offers a strong faculty support network and a variety of extracurricular activities that can accommodate different student needs.

Researchers in the retention field have found much to admire about Tinto's ideas even as they have struggled to verify them empirically, principally because academic and social integration are hard to define and, consequently, to measure. That said, Tinto's theory is consistent with the high attrition rates of freshmen and the idea, gleaned from the literature, that the first eight weeks of college are a particularly critical period for determining whether a student will stay the course.

The Educated Get Richer …

The gap between the income of high school graduates and the income of those with college and graduate degrees has widened.

Average Earnings as a Proportion of High School Graduates' Earnings



SOURCE: U.S. CENSUS BUREAU

(The Author)

YVONNE RALEY is assistant professor of philosophy and associate dean of arts and sciences at Felician College in Lodi, N.J. She teaches a freshman course in critical reasoning as well as applied ethics and metaphysics. She also participates in her school's efforts to integrate students into the college community.

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How to Prepare for College

You or your child is going to college. Here's how to tip the balance toward college success.

FOR STUDENTS

- Research the college: Visit prospective colleges, attend open houses and ask questions.
- Assess yourself: Are you ready to put the time, money and effort into getting a degree?
- Prepare: Attend a college preparatory program in high school if one is available. Participate in summer programs and take basic skills courses. Ask for a summer reading list. Register and plan your schedule early. Attend student orientations.
- Do not limit your options: Most students change their major at least once. Any degree trumps none at all.
- When a problem crops up, do not be shy. Seek out college services such as psychological counseling, career guidance, faculty mentoring or tutoring.

FOR PARENTS

- Research the college with your son or daughter.
- Provide emotional and social support, regardless of your child's choice of major or career.
- Help your son or daughter prepare. Encourage participation in summer programs and orientation sessions. Read and discuss the books on your child's reading list.
- Stay informed and in touch: Is your son or daughter involved in student activities? Has he or she made friends? What are his or her grades?

In addition, a 1997 meta-analysis (quantitative review) of retention studies led by Vanderbilt University education researcher John Braxton provides some support for Tinto's findings. Its conclusion: one of the key influences on a student's commitment to completing college is whether the student integrates successfully into social circles early on. If she does, she will be more likely to remain in college until graduation. Other variables that affect a student's commitment to school, Braxton and his colleagues reported, are "student entry characteristics" such as parental education level and other family factors; inborn traits such as academic ability, race and ethnicity, and gender; and achievement record in high school.

Buckling Down

Academic background, along with strong study skills and academic self-confidence, may be particularly important for stacking the deck in favor of graduation, some studies suggest. Highly selective public colleges and universities, which admit only those high school students who have high GPAs and SAT scores, graduate 76 percent of their students within five years, whereas public colleges with open admission, which admit anyone with a high school diploma, graduate a mere 34 percent of students within five years, according to a 2006 study by ACT, formerly the American College Testing Program [*see box on opposite page*].

A 2004 review of more than 100 retention studies conducted by ACT researchers pinpoints commitment to getting a degree, academic self-confidence, and good study and time management skills as top predictors of college graduation. Further, the ACT researchers found that general self-confidence and motivation to achieve do not correlate with retention, indicating that it is more specific academic goals that matter.

A student's high school grades and standardized test scores had less of a bearing on graduation, the ACT researchers concluded, but quite ably predicted college grades. This finding hints that persistence and study skills may be more critical for graduation than the ability to get stellar grades. That is, smart students who lose track of time, fail to study or to study properly, and do not value academic success may be less likely to pass enough classes to graduate than are less gifted students, who, despite not earning As, study diligently and manage their time well.

Getting a Jump Start

To ameliorate some of these problems, an innovative high school program known as the Early College High School Initiative helps to prepare students academically by exposing them to college-level courses during high school. In 125 high schools scattered across 23 states, the advanced courses are taught in small classes that provide additional learning time and academic support. They bolster basic math and literacy skills, including, for example, how to take notes, support opinions and analyze literature. Such schools also enable high school graduates to earn an associate degree (a two-year college degree) or enough credits to enter college as a junior, giving students an academic head start and relieving some of the financial burden of college.

College summer programs and remedial courses can also help students bone up on skills needed to succeed academically in college. At Felician College, we offer Jump Start, a free summer program for incoming students in which they attend classes to improve their reading, writing and math skills. Like many other colleges, Felician distributes a precollege reading list of some of the

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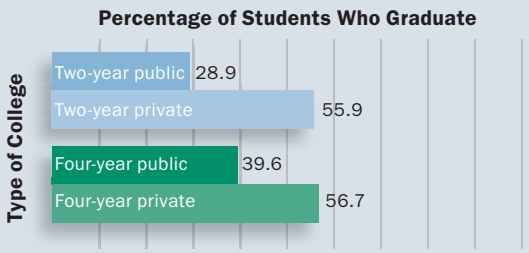
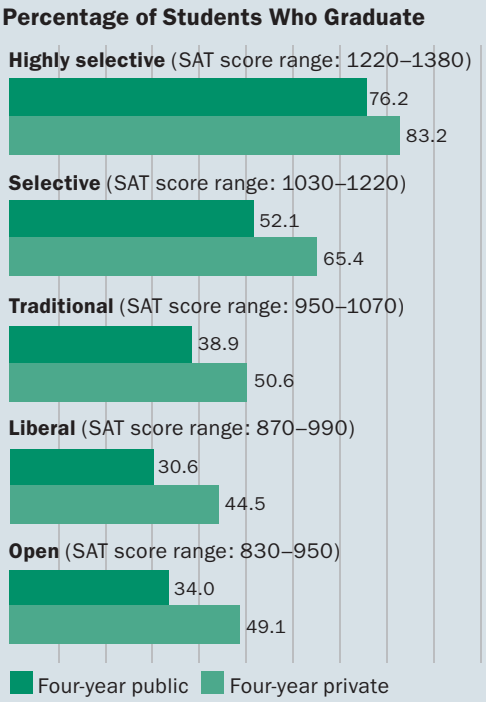
Who Graduates from College

Drop-out rates are higher at public colleges than at private ones, but even at private schools nearly half do not make it to graduation.



The more selective the college, the higher the percentage of graduates, with drop-out rates lower at every tier for private colleges as compared with public ones.



books students will encounter in their freshman year. And incoming students who lack basic math, reading or writing skills should seek first-semester classes that fill those gaps. Also, all freshmen would be wise to take a study skills course if their school offers one. Such courses can help students manage their time, take good notes and focus on the most important content of a lecture or textbook, among other habits that will help them survive the next four years.

But academic preparation is only part of the battle, if you believe Tinto. Feeling comfortable at college depends as much on an institution's social milieu as on having read Hemingway or passed geometry. Before picking a college, students should consider, for example, whether they would flourish best in a big school or a small one, in a religious or secular environment, in the country or a city, or in a single-sex or coed college. Students must carefully research and visit institutions and attend open houses, summer orientation sessions and prospective student receptions. They should use these occasions to ask questions about the school and meet other students and professors.

Individuals who immerse themselves in clubs or activities early in the year are also more likely to develop a sense of belonging at college. And taking at least some small classes can offer a valuable opportunity to interact with professors. In my classes, which average 10 to 20 students, I make a point of getting to know each student.

Meanwhile ties to the childhood home and family remain important, even as students try to move on. Parents should stay involved with their children and ask them about their grades, friendships, activities and overall happiness. Whenever practical, parents should visit their son or daughter at college—to help make school feel more like home. M

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- **College Student Retention: Formula for Student Success.** Edited by Alan Seidman. American Council on Education and Praeger Publishers, 2005.
- The Early College High School Initiative: **www.earlycolleges.org**

CHUCK SAVAGE *Corbis (photograph)*; ACT INSTITUTIONAL DATA FILE, 2006 *(data)*

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Can Antidepressants Cause Suicide?

The truth about antidepressants and suicide risk in children and adolescents

BY HAL ARKOWITZ AND SCOTT O. LILIENFELD

THE QUESTION POSED in the title of this column may strike many readers as odd. How can medications that have proved helpful in reducing depression also *cause* suicide? After all, suicide is a tragic complication of some cases of depression. Yet research and clinical observations over the past 40 years have raised concerns that these drugs produce suicidal thoughts, suicide attempts and possibly even suicide in a small subset of depressed patients. What are the risks?

In 2006 psychiatrist Tarek A. Hammad and his associates at the U.S. Food and Drug Administration published a meta-analysis (quantitative review) of studies involving a large number of children and adolescents taking antidepressants for depression, anxiety disorders and attention-deficit hyperactivity disorder (ADHD). Their results demonstrated that subjects on antidepressant medications had twice the risk (4 versus 2 percent) of suicidality (suicidal thoughts and attempts) as compared with those on placebo. No completed suicides occurred during any of the studies reviewed. A 2007 meta-analysis by psychologist Jeffrey Bridge of Ohio State University and colleagues at several institutions included additional studies and confirmed these results, although the percentages for suicidality were slightly lower.

These findings point to the drugs as the cause of the increased suicidality rather than depression.

COURTESY OF HAL ARKOWITZ (*top*); COURTESY OF SCOTT O. LILIENFELD (*bottom*); VICTOR HABBICK VISIONS *SPL/Photo Researchers, Inc.* (*left*)

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The risk for suicidality usually occurs within the **first days or weeks** of starting the medication.

The FDA Acts

The initial results of Hammad's meta-analysis were available to the FDA well before the article's publication. In the wake of these findings, the FDA placed a "black box warning" on all antidepressants in 2004. This warning applied to the entire class of antidepressants and stated that these drugs can increase the risk of suicidality in children and adolescents who have major depressive disorder or other psychiatric disorders. The black-box warning is the strongest one that the FDA can issue (and is so named because of the black border that usually surrounds the text of the warning). In 2007 the agency extended this warning to include people up to the age of 24, noting that the data did not show this increased risk in adults older than 24.

The risk for suicidality usually occurs within the first days or weeks of starting the medication. According to a 2004 FDA Public Health Advisory, public health officials are concerned that patients showing certain symptoms early in treatment or during a change in medication dosage may be at heightened risk for worsening depression or suicidality. This added risk is more likely if the symptoms are severe, abrupt in onset and not part of the depressive symptoms for which the patient initially sought treatment. These symptoms include anxiety, agitation, panic attacks, insomnia, irritability, hostility, impulsivity, severe restlessness, hypomania and mania. Fortunately, only a small percentage of people who show these symptoms are at risk for suicidality. Nevertheless, if these symptoms start to occur, they should be reported to the prescribing physician.

Advice about Antidepressants

Numerous studies in patients of all age ranges have found that antidepressants are helpful in about two thirds of depression cases. For children and adolescents, the data show that Prozac (fluoxetine) is fairly effective but that other antidepressants are not any more effective than a placebo pill. For adults, many different antidepressants have proved helpful. One major problem with antidepressants is the high rate of relapse (approximately 40 percent) that occurs after they are discontinued. Many researchers have found that the combination of an antidepressant and psychotherapy (especially cognitive-behavioral therapy) leads to greater symptom reduction and less suicidality and suicide than either treatment affords alone.

At a practical level, the risk of suicidality can often be adequately addressed by careful monitoring of patients, especially early in treatment. Unfortunately, most primary care doctors and psychiatrists do not do this; they usually arrange a follow-up meeting several weeks or more after the drug is prescribed. This may be the result of the doctors' lack of awareness of the risk of suicidality or the limits placed on the number of sessions by some insurance companies. Some even tell patients that such side effects are possible and that they will wear off in a week or two. This warning may discourage patients from calling doctors if the symptoms do occur. Treatment with both antidepressants and psychotherapy carries the built-in safeguard that the psychotherapist can monitor side effects and inform the patient and prescribing physician if any problems do occur.

Although there have been no research findings demonstrating completed suicide resulting from antidepressant usage in children and adolescents, a number of case reports suggest that there might be cause for concern. Case reports, however, are only suggestive and do not constitute hard scientific evidence. In addition, most studies that have found suicidality have been relatively short-term with small samples as compared with those needed to address this question; long-term risks have not yet been carefully evaluated. Most studies of people older than 24 have not reported increased suicidality with antidepressants. Nevertheless, we should be cautious about accepting this conclusion because we do not know the mechanism that explains why antidepressants can trigger suicidality in younger people.

In addition, these data may be subject to serious sources of bias, as we will discuss. To be on the safe side, physicians should also closely monitor adults who are taking antidepressants. If people who are taking antidepressants wish to stop, it is important that they consult their doctor before doing

FAST FACTS

Issues of Concern

1» **Suicide is a tragic complication of some cases of depression. Antidepressants have proved helpful in reducing depression.**

2» **Suicide is the third leading cause of death in adolescents (10 to 14 years old). Increased antidepressant use has been associated with a decrease in completed suicides.**

3» **Some studies, however, have shown that use of antidepressants in children and adolescents might cause a disturbing increase in suicidality (suicidal thoughts and attempts). What are the risks?**

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VICTORIA BLACKIE Getty Images

so and that they gradually taper off the drug rather than going "cold turkey." Stopping antidepressants abruptly can trigger an array of distressing symptoms, including dizziness, nausea, headache, fatigue, anxiety, irritability and sadness, to name just a few.

Conflicts of Interest?

The controversy regarding antidepressants and suicidality has both scientific and economic dimensions. In 2004 sales of commonly prescribed classes of antidepressants (including selective serotonin reuptake inhibitors, or SSRIs) in the U.S. alone reached $10.9 billion. Clearly, pharmaceutical companies have a large stake in these drugs. David Healy, a psychiatrist and former secretary of the British Association for Psychopharmacology, has argued that some drugmakers have often published biased results of studies on these medications and hidden or disguised their risks for more than 40 years. Others have vigorously challenged his conclusions.

Pharmaceutical makers have funded most drug trials to date, creating a potential conflict of interest for investigators and leading to the increased likelihood of an "experimenter expectancy effect." This effect occurs when researchers expect certain results—in this case, that antidepressants are safe and effective—and unintentionally influence the study design or analyses to find these results. Although double-blind procedures (in which neither the patient nor the research staff knows whether the patient is receiving an active medication or a dummy pill) can provide some protection against this bias, often controversy exists with respect to how well these procedures are implemented in medication studies.

It is also relevant that a major study funded by the National Institute of Mental Health found higher suicidality rates than those obtained in studies funded by drug companies. Moreover, many drug companies have provided ghostwriters to write up drug trials for publication, potentially biasing the document by slanting its descriptions toward favorable drug effects. Finally, there have been reported instances (for example, the recent scandal regarding the drug Vioxx) in which pharmaceutical companies have hidden negative evidence. Although this type of nondisclosure has not been clearly demonstrated for antidepressants, it remains a disturbing possibility.

In response to these concerns, the International Committee of Medical Journal Editors (ICMJE) has recently required that authors submitting papers must disclose all financial and personal relationships that might bias their work, state whether potential conflicts exist, identify individuals who provided writing assistance, and

(The controversy regarding **antidepressants and suicidality** has both scientific and economic dimensions.)

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Fortunately, there is a **safe alternative** to antidepressants, many, but not all, studies show.

disclose the funding sources for this assistance. Perhaps most important, the ICMJE requires authors to register all clinical trials they have conducted with a not-for-profit organization, whether or not the studies have been published. In this way, *all* studies will be publicly available at no charge, not just those that have obtained positive results. In addition, the FDA requires drug companies to submit the results of all studies that have been conducted, including efficacy and safety data, in their application for FDA approval.

So, do antidepressants cause suicide? The available data suggest that they probably do not, but potential biases in the research render this conclusion tentative. Nevertheless, some antidepressants do appear to cause at least a slight increase in suicidal thoughts and attempts in children, adolescents and young adults.

Suicide is the third leading cause of death in adolescents (10 to 14 years of age) in the U.S. Many investigators have found that increased antidepressant use is associated with decreased rates of completed suicides. If black-box warnings lead physicians to decrease their administration of antidepressants, the rate of completed suicides may increase. Results of a recent study in the Netherlands suggest that this may be the case: the suicide rate in children and adolescents has increased by more than 40 percent since 2003, when prescription rates of antidepressants began to *decrease*.

A better alternative to prescribing antidepressants to fewer children and adolescents would be to continue to prescribe them but with close and careful monitoring by the physician. Otherwise, we may be faced with a tragic irony: efforts to protect children from suicidal thoughts and attempts through lower antidepressant prescription rates may lead to greater harm through increased suicide rates because of inadequately treated depression.

WARNING

SUICIDALITY IN CHILDREN AND ADOLESCENTS

ANTIDEPRESSANTS INCREASED THE RISK OF SUICIDAL THINKING AND BEHAVIOR (SUICIDALITY) IN SHORT-TERM STUDIES IN CHILDREN AND ADOLESCENTS WITH MAJOR DEPRESSIVE DISORDER (MDD) AND OTHER PSYCHIATRIC DISORDERS. ANYONE CONSIDERING THE USE OF [INSERT ESTABLISHED NAME] OR ANY OTHER ANTIDEPRESSANT IN A CHILD OR ADOLESCENT MUST BALANCE THIS RISK WITH THE CLINICAL NEED. PATIENTS WHO ARE STARTED ON THERAPY SHOULD BE OBSERVED CLOSELY FOR CLINICAL WORSENING, SUICIDALITY, OR UNUSUAL CHANGES IN BEHAVIOR. FAMILIES AND CAREGIVERS SHOULD BE ADVISED OF THE NEED FOR CLOSE OBSERVATION AND COMMUNICATION WITH

In 2004 the Food and Drug Administration placed a "black box warning" on the entire class of antidepressants.

Many questions remain. Will future studies conducted independently of the influences of drug companies show different risks of suicidality and suicide in young people? Will we continue to find a lack of antidepressant-induced suicidality and suicide in adults? What will longer-term studies reveal about the effects of antidepressants on suicide and suicidality? We hope that recent efforts to reduce sources of bias in research will provide us with more accurate answers to these important questions.

Fortunately, there is a safe alternative to antidepressants. Many, but not all, studies have shown that short-term psychotherapies (12 to 16 sessions), with or without medication, are at least as effective as medication for depression and anxiety, maintain patient improvement better in the long run, and carry little or no associated risk of suicide. Yet because psychotherapists do not have advertising budgets remotely approaching those of drug companies, many mental health consumers are unaware of these important findings.

Given the present state of knowledge, we support the use of antidepressants, particularly fluoxetine, as one treatment for depression and anxiety in children, adolescents and young adults, as long as the treatment is closely monitored. Fluoxetine and many other antidepressants have proved effective in adult populations, and we support their use with those older than 24 as well. The data show, however, that a combination of psychotherapy, particularly cognitive-behavioral therapy, and antidepressant medication is the most effective, enduring and safe treatment. M

HAL ARKOWITZ and SCOTT O. LILIENFELD serve on the board of advisers for *Scientific American Mind.* Arkowitz is a psychology professor at the University of Arizona, and Lilienfeld is a psychology professor at Emory University. The authors thank Steve Hollon of Vanderbilt University and David Brent of the University of Pittsburgh for their invaluable help with this column and their willingness to share their extensive knowledge of the area. Any statements made in the column, however, are solely the responsibility of the coauthors. Send suggestions for column topics to editors@sciammind.com

(Further Reading)

- **Let Them Eat Prozac: The Unhealthy Relationship between the Pharmaceutical Industry and Depression.** D. Healy. New York University Press, 2004.
- **Suicidality in Pediatric Patients Treated with Antidepressant Drugs.** T. A. Hammad, T. Laughren and J. Racoosin in *Archives of General Psychiatry,* Vol. 63, No. 3, pages 332–339; March 2006.

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Mind Reads

The Logic of Intuition

Gut Feelings: The Intelligence of the Unconscious

by Gerd Gigerenzer. Viking, 2007 ($25.95)

How does an outfielder catch a baseball? It's amazing, really. A ball's trajectory is described by a complicated set of mathematical equations, but the human brain has evolved a simple way to solve the problem: watch the ball and move such that the angle between your eyes and the ball stays constant. Kids automatically follow this "gaze heuristic" in their first game of catch, even though no one has explained it to them.

Our brains have developed simple guidelines such as the gaze heuristic to let us function in a complicated world. These rules form the basis of our intuition, writes Gerd Gigerenzer, a psychologist at the Max Planck Institute for Human Development in Berlin. Despite what philosophers and economists have believed for centuries, reason may not be the best decision-making tool we have at our disposal. Intuition, he asserts, can be better. (For more about the science behind intuition, see "The Powers and Perils of Intuition," by David G. Myers; SCIENTIFIC AMERICAN MIND, June/July 2007.)

Gigerenzer, whose research informed Malcolm Gladwell's popular book *Blink* (Little, Brown, 2005), provides fascinating examples of situations in which intuition is accurate, and he goes one step further to explain *why* intuition is so frequently correct. Contrary to popular belief, he argues, intuition is not based solely on impulse—it has its own rationale rooted in brain capacities that have developed over evolutionary time. And although the rules of thumb that guide intuition are surprisingly unsophisticated, they are also astonishingly accurate. These principles can guide people who know very little about a topic to make choices as good as those made by people who know a lot.

For example, most people subconsciously assign a greater value to something they recognize (such as a celebrity, a famous city or a brand name) than to something unfamiliar. People who know little about tennis but recognize the names of a few famous players will predict tennis match outcomes nearly as well as tennis aficionados will. We naturally assume that the players whose names we recognize are more likely to win—and indeed, they usually do.

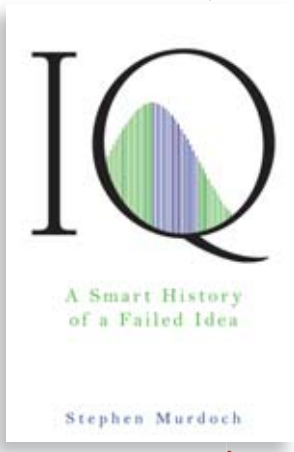
Gigerenzer supports his arguments with upbeat and entertaining examples that, as an added bonus, are directly applicable to our lives. We use our intuition every day to make decisions—from how we answer trivia questions to whom we date. In *Gut Feelings,* Gigerenzer argues compellingly that what we feel in our gut is informed by our brain—and thousands of years of experience. It's time we gave those feelings some credence.

—Melinda Wenner

Unintelligent Quotient

IQ: A Smart History of a Failed Idea

by Stephen Murdoch. John Wiley & Sons, 2007 ($24.95)



In the early morning hours of August 17, 1996, Daryl Atkins shot a man at close range, killing him. While Atkins was on trial, his IQ was determined to be 59, well below most states' cutoff of 70 for mental retardation—and for the death penalty. After several appeals, Atkins's IQ was tested again in 2005, and the results were similar. But when the prosecution demanded a third IQ test two days later, Atkins scored a 76. Within 48 hours Atkins had gone from being considered too stupid to plan a murder to being a candidate for the death penalty.

Atkins's case is one of the many compelling examples that journalist Stephen Murdoch describes to illustrate the momentous impact that IQ tests have on public policy and private lives and the shaky grounds on which these exams stand. *IQ* is a journey through the history of intelligence testing, revealing it to be "full of abuses" and plagued by "catastrophically terrible policy ideas." Murdoch cites evidence that intelligence testing has served as a justification for atrocities ranging from forced sterilization in the U.S. to horrors in Nazi Germany.

Murdoch shows how intelligence tests grew out of practical and historical necessity—for example, to let overwhelmed military personnel quickly sort through large numbers of possible recruits—rather than from agreement about what intelligence actually is. And instead of assessing innate intelligence, IQ tests measure knowledge and problem-solving abilities. Moreover, in the 100 years since the first intelligence test was published, IQ test questions have changed startlingly little.

Despite intelligence testing's troubled history, many psychologists believe that IQ tests are useful. Some research has shown that IQ tests reliably predict an individual's performance at school or on the job. In *IQ,* however, Murdoch presents a provocative and compelling account of the severe shortcomings of these tests, making a convincing argument for their abolishment.

Murdoch concludes that "it's time for psychologists and other intelligence experts to devise better tools. In the interim, they should stop trying to persuade the rest of us that they can test intelligence, because they can't, and such claims are dangerous."

—Nicole Branan

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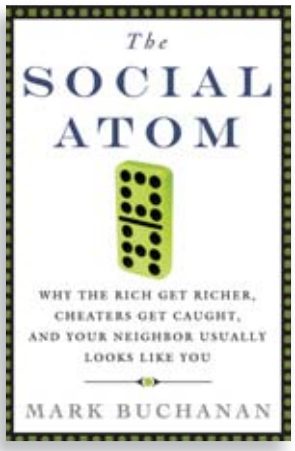
People as Particles

The Social Atom: Why the Rich Get Richer, Cheaters Get Caught, and Your Neighbor Usually Looks Like You

by Mark Buchanan. Bloomsbury, 2007 ($24.95)

From hurricanes to supernovae, scientists have employed the laws of physics to explain the behavior of everything in nature—except humans. But that's about to change, claims journalist and theoretical physicist Mark Buchanan, who says that we are currently witnessing something "akin to a quantum revolution" in the social sciences. On a grand scale, people may be as predictable as particles.



In *The Social Atom,* Buchanan offers a glimpse into a new research frontier that applies the principles of physics to the study of human social behavior. Just as physicists decipher the forces that govern the organization of individual atoms into different materials, Buchanan says, it is possible to figure out the physical laws of the human world if we treat people as "social atoms" forming "social matter." He disputes the long-held notion that the fact that free individuals can do whatever they please makes any predictions about their behavior impossible. Buchanan argues that when we look at patterns rather than people, the impact of our individuality dwindles, much like in physics where "atomic-level chaos gives way to the clockwork precision of … planetary motion."

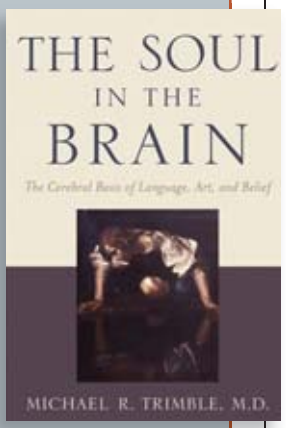
Buchanan presents a few of the social atom's basic properties and asserts that learning what happens when many of these particles interact will enable us to explain scenarios ranging from stock market fluctuations to mass genocide. His characterization of social atoms is neither new nor surprising: they tend to imitate one another, organize themselves in groups with atoms similar to themselves, and let emotions influence their thinking and decision making. But Buchanan presents these old ideas in a new and unusual light. For example, in the same way that individual microscopic atomic magnets in a chunk of iron tend to line up even in the absence of an external magnetic field, social atoms coerce their immediate neighbors into adopting opinions and behaviors similar to their own, he explains. Such social forces can eventually lead to outcomes that few individuals ever intended, such as ethnic and gang warfare.

The underlying idea of *The Social Atom* is compelling, and Buchanan succeeds in whetting the appetite for future findings from the nascent field of social physics. He admits that any great discoveries about the inner workings of social matter are unlikely to solve global society's myriad problems. Instead, Buchanan believes, we will continue "muddling through," but "our muddling skills will greatly be enhanced by a proper appreciation of the hidden forces that drive the world." *—Nicole Branan*

Nietzsche's Brain

The Soul in the Brain: The Cerebral Basis of Language, Art, and Belief

by Michael R. Trimble. Johns Hopkins University Press, 2007 ($35)



Nineteenth-century German philosopher Friedrich Nietzsche invoked the Greek gods Apollo and Dionysus to represent two contrasting tendencies of the human mind—the Apollonian focus on logic and order and the Dionysian mode of intuition and emotion.

Drawing on this dichotomy, behavioral neurologist Michael R. Trimble of the University of London delves into the neurobiological roots of human culture in *The Soul in the Brain.* Trimble's emphasis is on music, poetry and religion—in short, culture's more Dionysian elements—which he argues are all closely related to one another and strongly shaped by the brain's right hemisphere.

Much as Nietzsche regarded Socrates and his philosophical followers as too narrowly Apollonian, Trimble criticizes his fellow neuroscientists as overly focused on the left hemisphere, which is traditionally thought to be dominant for language skills. Citing the linguistic effects of various forms of brain damage and dysfunction, he contends persuasively that the right hemisphere plays a key role in language elements such as tone, timing and the use of metaphor—the stuff of poetry but crucial even in everyday prose.

Musical skills and perceptions also depend heavily on the right hemisphere, as evidenced by brain scans and other data; the right frontal cortex, for instance, is involved in memory for pitch, and the right temporal lobe handles timbre perception. Music and poetry share a reliance on rhythm, an ability to evoke strong emotions and an important presence in religious ceremonies. The neural circuits underlying music, poetry and religion, in Trimble's view, probably have extensive overlap in the right hemisphere, a possible linkage that neuroscience has only begun to explore.

Why do poems, songs and rituals touch people so deeply? Trimble's plausible speculation is that such activities tap the right cerebrum's connections to evolutionarily older parts of the brain, including the emotion-laden limbic system. Discussing why people love to cry at the theater, he suggests that such crying is a bridge back to a more primordial state of mind. Echoing Nietzsche's view that great tragic art requires a melding of the Apollonian and Dionysian, Trimble asserts that creativity and a full mental life depend on interaction between the left and right hemispheres.

Curiously, while celebrating Dionysus, *The Soul in the Brain* maintains a distinctly Apollonian tone; Trimble's writing style is a bit dry, and he says little about his own experiences with patients, relying instead on published literature. Still, the book is a highly thought-provoking excursion through neuroscience, philosophy and culture. *—Kenneth Silber*

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ask the Brains

Why are games like Sudoku so mentally satisfying? Do they activate a pleasure center in the brain, or do they merely provide the satisfaction of solving problems?

—Kirk McElhearn, Guillestre, France

Mark A. W. Andrews, professor of physiology and director of the Independent Study Pathway at the Lake Erie College of Osteopathic Medicine, explains:

THOUGHT-STIMULATING activities such as Sudoku and crossword puzzles elicit positive emotional reactions from many (if not most) people. Science has not yet found a definitive answer as to why we enjoy these games so much, but research into emotions, though in an early state, has yielded some clues.

In your question you hint at a distinction between pleasure and satisfaction. In fact, MRI brain scans have provided evidence that there is indeed a significant difference between these feelings. Pleasure and happiness are passive emotions that happen to us as the result of outside stimuli. Satisfaction, on the other hand, involves an active pursuit—it is the emotional reward we get after adapting to a new situation or solving a novel problem. Studies have found that novelty is important in evoking satisfaction, which helps to explain why, even though all Sudoku puzzles are similar, solving each one of them instills a sense of accomplishment.

MRI scans indicate that a "satisfaction center" exists deep within the brain in a group of structures called the limbic system, which is best known as the seat of emotions and motivation. Specifically, satisfaction is most strongly associated with a structure called the striatum, which is activated by stimuli associated with reward. The striatum, in turn, is connected to areas of the frontal lobe that are involved with directing logical thoughts and actions toward goals. It is this interaction between the "intellectual" cortex and the "emotional" striatum that motivates us and gives us pleasure as a response to solving problems.

The chemical basis of satisfaction appears to be linked to the neurotransmitter dopamine, although it might also involve other neurochemicals. Dopamine plays many crucial roles in our mental and physical health and has long been known to be a factor in drug abuse and other addictive behaviors. In a way, people who say they are "addicted to crossword puzzles" are correct—the "rush" of accomplishment and satisfaction they get from solving each puzzle drives them to solve another.

Is it possible to think two thoughts simultaneously?

—Rich Dobrow, Barnegat, N.J.

Psychologist **Barry L. Beyerstein** of Simon Fraser University in Burnaby, British Columbia, replies:

THE ANSWER depends on how you define "thought." If a thought is the perception or operation that you are currently aware of at any specific moment, it does seem that we can attend to only one mental process at once. Psychologists often describe this "selective attention" as functioning like a spotlight that roves about a stage, illuminating one (and only one) actor at a time. Yet if the definition of thought is broadened to include the many other mental operations going on in parallel with the one you happen to be attending to, it follows that we can be thinking more than one thought at a time.

Satisfaction involves an active pursuit—it is the emotional reward we get after adapting to a new situation or solving a novel problem.

If you have ever driven a car, you know that your brain can handle a wide variety of stimuli simultaneously. An accomplished driver does a huge amount of extremely vital processing outside of his or her awareness—taking in traffic signals, other cars and obstacles on the road while chatting to passengers, listening to the radio, watching the scenery or talking on the phone. The brain is responding to each and every stimulus appropriately, but attention can be focused on only one activity at a time. This small window of awareness we call "consciousness" highlights, for our voluntary supervision and response, only a small fraction of the many operations that are churning away simultaneously in our brain.

Neuroscientists see the brain as a collection of many specialized, semi-autonomous modules that work in parallel. Each does its particular job unnoticed, behind the scenes. When a module completes a task, it moves to center stage for a short moment, grabs the so-called executive part of consciousness and displays the fruits of its unattended labors to our window of subjective awareness. M

Have a question? Send it to editors@sciammind.com

COURTESY OF MARK A. W. ANDREWS (*top*); RON LONG *Simon Fraser University* (*bottom*)

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Head Games

Match wits with the Mensa puzzlers

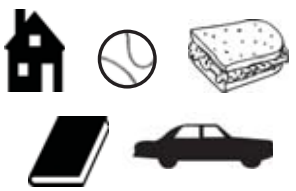
1 Nobody was seen writing this cryptic note. Who wrote it?

GH Z L RS G BCD
H KLM U GH R FGH A K D KL YZ M

2 Each letter stands for a different digit. Determine their values to solve the subtraction problem.

A N T E – E T N A = N E A T

3 What four-letter word is the common link among these five objects?



4 Change the first two letters of one African country to get the name of another African country.

5 Can you think of two kinds of people—one in a job position, one perhaps in a compromising position—whose titles contain the consecutive letters "MPTR"?

6 Find a two-digit number *N* with the following properties:

***N* × 2 + 1 is divisible by 3**
***N* × 3 + 1 is divisible by 4**
***N* × 4 + 1 is divisible by 5**

7 Each of the boxes below contains the scrambled name of an element in the periodic table, with one letter missing. Find the names of all six elements and write down the missing letters. Then take those six letters, add one more letter, and rearrange them to get the common (not Latin) name of a seventh element.

I C U L A C	S E C R A N	R E M R Y C
P O Y R K N	O N E R I M	O I L N I C

8 The three international weather symbols shown here represent specific types of the following:

Severe storm **Sky condition** **Wind condition**

Each of these answers has an anagram, clued by the following definitions:

More vulgarly suggestive (9 letters)
What a stage ham does (8 letters)
Something you might dig for at the shore (4 letters)

Can you identify the three symbols and their anagrams?

9 Fill in the blanks according to the clues.

a)	**C _ _ A R**	**Lucid**
b)	**_ C A R _**	**Frightening**
c)	**C A _ _ R**	**Provide food for**
d)	**C _ A R _ _ _**	**Type of nonprofit organization**
e)	**C _ A R _ _**	**Not fine**
f)	**C _ A _ _ _ R**	**Found between glass and wood**
g)	**C _ _ A _ _ R**	**Could be a weapon**
h)	**C _ A R _ _ _ _**	**Special magnetic appeal**
i)	**_ _ _ C A R _**	**Some of the eyes have it**

Answers

1. The invisible man. Crack the code by going to the next letter in the alphabet:
GH ZL RS G BCD H KLM U GH R FGH A K D KL YZ M
I AM THE INVISIBLE MAN

2. A = 7, E = 1, N = 6, T = 4.

3. They all form a common phrase or compound word when combined with the word "club" (clubhouse, ball club, club sandwich, book club, club car).

4. Algeria and Nigeria.

5. Comptroller and temptress.

6. *N* = 61. (61 × 2 + 1 = 123 = 3 × 41; 61 × 3 + 1 = 184 = 4 × 46; and 61 × 4 + 1 = 245 = 5 × 49.)

7. Calcium, arsenic, mercury, krypton, bromine, silicon. Seventh element: bismuth. If a Latin name had been allowed, an alternative answer could have been stibium, an earlier name for antimony.

8. a) hurricane/raunchier
b) overcast/overacts
c) calm/clam

9. a) CLEAR
b) SCARY
c) CATER
d) CHARITY
e) COARSE
f) COASTER
g) CLEAVER
h) CHARISMA
i) MASCARA

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